DOCUMENT RESUME

ED 381 341 SE 054 604

AUTHOR Korpan, Connie A.; And Others
TITLE Assessing Scientific Literacy: A Taxonomy for Classifying Questions and Knowledge About Scientific Research. Technical Report No. 94-1.
INSTITUTION Alberta Univ., Edmonton. Centre for Research in Child Development.
SPONS AGENCY Social Sciences and Humanities Research Council of Canada, Ottawa (Ontario).
PUB DATE May 94
NOTE 87p.
PUB TYPE Reports - Research/Technical (143)

EDRS PRICE MF01/PC04 Plus Postage.
DESCRIPTORS *Criticism; *Educational Research; Elementary Secondary Education; *Evaluation; Science Education; *Scientific Literacy

ABSTRACT

There is growing public recognition that adequate levels of scientific literacy are not being attained by many children and adults. This manual was designed for use in a resarchproject focused on one facet of scientific literacy, namely, how individuals assess the credibility of brief reports of treatment studies. The interest is in (1) the types of requests for information that people make about these reports as an index of their potential to assess credibility of research conclusions and (2) reasons people have for asking these questions as a means to make inferences about the knowledge structures that give rise to their requests. An examination of people's requests and their justifications for the requests is used to determine (1) what people know about features of scientific research; (2) how, when, and whether people engage in evaluative thinking about these features when reading reports of scientific investigations; and (3) how these characteristics of knowledge and thinking vary as a function of age and schooling from adolescence through early adulthood. Responses are used to make inferences regarding the underlying knowledge structures that are involved in the evaluation of scientific research, as well as to understand how structures are related to opportunities to learn. (ZWH)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

ED 381 341

ASSESSING SCIENTIFIC LITERACY: A TAXONOMY FOR CLASSIFYING QUESTIONS AND KNOWLEDGE ABOUT SCIENTIFIC RESEARCH

Connie A. Korpan, Gay L. Bisanz,

Tammy L. Dukewich, Katherine M. Robinson, Jeffrey Bisanz, Mike H. Thibodeau,

Karen E. Hubbard, and Jacqueline P. Leighton

Department of Psychology

University of Alberta

Technical Report No. 94-1

Centre for Research in Child Development

University of Alberta

Edmonton, Alberta, Canada T6G 2E9

May 1994

This manuscript was supported by a grant from the Social Sciences and Humanities Research Council of Canada to G. Bisanz, J. Bisanz, and J. Henderson. T. Dukewich is now at the Department of Psychology at University of Notre Dame, M. Thibodeau at the Department of Psychology at University of Saskatchewan, K. Hubbard at the Department of Psychology at Carleton University, and J. Leighton at the Department of Educational Psychology at the University of Alberta.

"PERMISSION TO REPRODUCE THIS MATERIAL HAS BEEN GRANTED BY

Gay L. Bisanz

Director

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)."

U.S. DEPARTMENT OF EDUCATION
Office of Educational Research and Improvement
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)

X This document has been reproduced as received from the person or organization originating it.

☐ Minor changes have been made to improve reproduction quality.

• Points of view or opinions stated in this document do not necessarily represent official OERI position or policy.

SE 054 404

TABLE OF CONTENTS

Introduction	2
Participants' Task	3
Coding Task	3
General Procedure for Coding	4
Coding Principles	4
Assignment of Topics	6
Steps for Assigning a Topic Code	7
Topic Descriptions	9
Social Context, Topic 1.0	9
Agent, Topic 2.0	21
Methods, Topic 3.0	25
Data/Statistics, Topic 4.0	36
Relevance, Topic 5.0	41
Related Research, Topic 6.0	45
Other, Topic 7.0	48
Ambiguous, Topic 8.0	48
Off-task, Topic 9.0	49
Assignment of Knowledge Domains	50
Steps for Assigning a Knowledge Domain Code	50
Knowledge Domain Descriptions	53
Scientific Practices, Knowledge Domain 1.0	54
Social Context, Knowledge Domain 2.0	65
Functions of Science, Knowledge Domain 3.0	69
Other, Knowledge Domain 4.0	71
Ambiguous, Knowledge Domain 5.0	71
No Identifiable Knowledge Domain, 6.0	71
Identification of Requests and Justifications	72
Identification of Idea Units	72
Numbering the Responses	74
Elaborated Procedure for Coding	74
References	75
Appendix 1: Sample Stories and Questionnaire Prompts	76
Appendix 2: Summary of Topic Codes	79
Appendix 3: Summary of Knowledge Domain Codes	82
Index	84

INTRODUCTION

There is growing public recognition that adequate levels of scientific literacy are not being attained by many children and adults (American Association for the Advancement of Science, 1989; Science Council of Canada, 1984). Because the quality of life in the 21st century depends upon on an educated populace that is scientifically and technologically competent, the problem of scientific literacy deserves serious attention. This manual was designed for use in a research project focused on one facet of scientific literacy, namely, how individuals assess the credibility of brief reports of treatment studies. These reports are pervasive in classroom textbooks and the popular media. Our interest is in (a) the types of requests for information that people make about these reports as an index of their potential to assess credibility of research conclusions and (b) reasons people have for asking these questions as a means to make inferences about the knowledge structures that give rise to their requests.

Questions are the basis of scientific investigation. They are a hallmark of good thinking and a good education. They are fundamental to the instructional dialogue in any classroom and the informal types of assessment that teachers make about what students know. Empirically, we hope that an examination of peoples' requests and their justifications for the requests will allow us to determine (a) what people know about features of scientific research, (b) how, when, and whether people engage in evaluative thinking about these features when reading reports of scientific investigations, and (c) how these characteristics of knowledge and thinking vary as a function of age and schooling from adolescence through early adulthood. Our research is conducted in the information processing tradition in psychology, but our theoretical agenda is also structuralist and contextualist in flavor: We seek to use these responses to make inferences about the underlying knowledge structures that are involved in the evaluation of scientific research, as well as to understand how structures are related to opportunites to learn, including classroom experiences, general educational background, and disciplinary training. This manual may be of value to anyone with similar objectives. It can be used to characterize the performance of groups as well as individuals.

In writing this manual, we had to make two assumptions about the background of the individuals most likely to use it. First, coders should be knowledgeable about science and the process of conducting science--at least as knowledgeable as the individuals whose responses are being coded. Second, the coder should have the equivalent of a 4-year university degree in the sciences, or social sciences, and have some knowledge of probability and statistics to adequately categorize people's responses. Others may be able to use this manual, but special, more elaborate explanations of concepts and

terminology may be required.

Participants' Task

The series of studies designed to examine scientific literacy in this project required that the participants complete a questionnaire containing several news briefs. Participants were asked to read each news brief carefully and then list the information they would need or questions they would want answered to help them evaluate the conclusion of the news brief (e.g., "What additional pieces of information would you like to have about the researchers' report to decide whether the conclusion...is correct?" or "Please generate a list of as many questions as you can that you would want to have answered before you decide whether the conclusion...is true. What is the first question that you would want answered?" then, "What is the next question you would want answered?"). In some studies, participants were also asked to justify how this information would help to evaluate the conclusion (e.g., "How would an answer to this question help you to decide whether the...conclusion in the news brief is true?" or "Why would you would want each question answered?"). Samples of the news briefs and the questions used to prompt the participant are provided in Appendix 1.

Coding Task

The information that participants said they would need or the questions they posed will be referred to as 'requests'. Requests are generally 'who', 'what', 'where', 'why' and 'how' questions or phrases that can be turned into these types of questions.

Responses that appear after the prompts, "How would an answer to this question help you to decide whether the underlined conclusion in the news brief is true?" or "Why you would want each question answered?" will be referred to as justifications. Justifications are generally statements that could begin with the word because. These statements provide the reason or motivation for the request and reflect the participants' knowledge or understanding of the importance of the information requested.

When coding responses, there are two primary goals. First, the coder must identify the topic of the request. The topic can be thought of as the basic theme or idea underlying the request. Descriptions of the topics to be used when coding are provided in the section "Topic Descriptions". Second, the coder must identify the domain of knowledge that is addressed by the justification. The knowledge domain is the core knowledge about science that prompts the participant to request the

information that they see as important to evaluating scientific research. Descriptions of the knowledge domains to be used when coding are provided in the section "Knowledge Domain Descriptions".

General Procedure for Coding

The procedure for coding is:

1) Read the response to the first prompt, which should be a request for information.
2) Identify the main idea in the request and assign a corresponding topic code.
3) Read the response to the second prompt, keeping in mind that this response is a justification for the initial request.
4) Identify the central idea that constitutes the justification for the request and assign a corresponding knowledge domain code.

Ideally, this means that participants should express a single idea in response to the first prompt which can be given a topic code and then provide a single justification for the request which can be given a knowledge domain code. However, participants do not always do things in a straight forward manner. They may identify more than one idea in their initial request for information, the justification may not be related to the initial request, the justification may be stated as part of the initial request, or no justification may be provided. Detailed procedures for dealing with these instances are outlined throughout the manual.

Coding Principles

Use the following principles to assist with coding:

PRINCIPLE 1: *Assume that the participant is doing the task.*

When assigning topic codes, assume that ideas following prompts such as "What is the next question you would want answered?" are requests that receive topic codes.

When assigning knowledge domain codes, assume that ideas following prompts such as "How would an answer to this question help you to decide whether the underlined conclusion in the news brief is true?" are justifications for the requests that should receive knowledge domain codes.

Finally, assume that participants use each numbered space in the questionnaire to reflect a single idea that can be captured in the taxonomies either as requests or as justifications.

This principle has implications for (a) assigning codes for topics and knowledge domains (b) identifying the link between the requests and the corresponding justifications, and (c) partitioning responses into units that represent separate requests and justifications. The implications of these principles for coding are detailed in the sections entitled "Assignment of Topics", "Assignment of Knowledge Domains", and "Identification of Requests and Justifications", respectively.

PRINCIPLE 2: *Topic codes should be assigned based on information in the requests only, whereas knowledge domain codes should be made based on the information in both the justification and related request.*

When classifying ideas that are requests, use of information from the justification portion of a student's response is prohibited. Use of this information can undermine inter-rater reliability and affect the validity of comparisons between studies. When classifying ideas that are justifications, use of the request information is essential. To give a knowledge domain coding, the coder should ask, "How does the justification explain (or motivate) the request?"

PRINCIPLE 3: *There are only three classes of requests and justifications. Responses may be (a) rudimentary or ambiguous with respect to the categories listed in each taxonomy; (b) representative of one of the categories listed in each taxonomy; or (c) representative of an "other" category.*

Rudimentary ideas are the most naive type of response. They address an idea in a simple superficial way. (e.g., What methods did they use?). Ambiguous ideas are vague responses. They seem to be loosely related to more than one category, but there is not enough information in the responses to assign them to a single category.

Responses that are coded as other, address a specific idea that is not reflected in the categories.

Therefore, to assign either topic or knowledge domain code, the coder should identify the top level category that best fits the request or justification and then ask three key questions:

a) Is this response rudimentary or ambiguous with respect to the categories listed?
b) Does this response fit one of the categories listed?
c) Does this response belong to another category not specified in the taxonomy?

Every request or justification belongs to one of these three classes.

PRINCIPLE 4: *Codes for justifications can be assigned to knowledge domains on the basis of a strict or lenient criterion.*

A lenient criterion is being used when a inference is required to assign a knowledge domain code to the justification. In this case, the reason or motivation is not clearly specified in the participant's response, but the justification seems to be related to a knowledge domain in the taxonomy. To be clear of the reason or motivation behind the participant's request, the coder would have to continue to ask the participant why this information is important. A strict criterion is being used when a knowledge domain code is assigned to a justification only when the reason or motivation for the request is clearly spelled out. Participants often only hint at the reason or motivation they have for making a request, so a more lenient criteria is typically used to capture the majority of the data.

The procedures and guidelines for coding requests and justifications according to these principles are outlined in the sections that follow. Brief references to these principles are made throughout the sections on "Assignment of Topics" (below) and "Assignment of Knowledge Domains" (p. 50). Use these descriptions to clarify the coding procedure as needed.

ASSIGNMENT OF TOPICS

This section is focused on the procedure for assigning topic codes which characterize the ideas that appear after prompts like: "What additional pieces of information would you like to have about the researchers' report to decide whether the conclusion . . . is correct?" or "Please generate a list of as many questions as you can that you would want to have answered before you decide whether the conclusion . . . is true."

Topic assignment means identifying the gist of the request. Topics reflect the content of the request and topic codes should reflect the main idea of the request. The topic is the focus of the request. Requests may vary in specificity, length or complexity.

When assigning a topic code, it is important to take each request as it is written and not add information to the request that may change it. Ideally, the information requested should be related to the research in the news brief. If no logical link between the request and the news brief can be found then, the participant is not doing the task and the request should be coded as "off-task".

STEPS FOR ASSIGNING A TOPIC CODE

REMEMBER PRINCIPLE 1*: Assume the participant is doing the task.*

REMEMBER PRINCIPLE 2*: Topic codes should be assigned based on information in the requests only.*

1) Read the response that appears after prompts like: "What is the first/next question you would want answered?".

2) Decide what the request is about. To do this it may be necessary to paraphrase the response to the first prompt. Be especially careful when paraphrasing not to add anything to the response that was not part of the initial statement.

3) To assign a topic code, decide which of the 'top level' categories encompasses the request. That is decide whether it is related to Social Context (1.0), Agent (2.0), Methods (3.0), Data/Statistics (4.0), Relevance (5.0), Related to Other Research (6.0), is some other topic (7.0), is ambiguous but relevant (8.0), or is completely off-task (9.0).

REMEMBER PRINCIPLE 3*: There are only three classes of requests. Requests may be (a) rudimentary or ambiguous with respect to the categories listed; (b) representative of one of the categories listed; or (c) representative of an "other" category.*

4) Once the general area is identified, examine the subcategories within that section to determine whether or not the request can be classified further. Use the most specific level of classification that the request clearly fits into.

a) Recall, from the description of Principle 3, that requests that are too rudimentary or are too ambiguous to be given a specific subcategory topic code should be given a topic code that reflects a more general level of classification. Note that if the request is too rudimentary or ambiguous with respect to the top-level categories, the request should be coded as 8.0 Ambiguous but Relevant.

b) If requests reflect information that is not captured by the specified categories, code the request as an "OTHER" category in line with the top-level category that best describes it. Note that if there is no top-level category that reflects the gist of the request then the request should be coded as 7.0, Other.

c) If the request clearly addresses more than one specific topic, it will be necessary to separate the request into separate ideas according to the guidelines set out in the section on "Identification of Requests and Justifications", and code each idea separately.

NOTE: It may be difficult to decide whether the request reflects two separate topics or is an ambiguous request. If you can code the request as topic 'a' AND topic 'b', then it reflects two ideas; if you can code the request as topic 'a' OR topic 'b', then it is ambiguous.

NOTE: Examples provided with each topic description in the next section are not exhaustive and requests may represent the same idea in different ways. Examples were taken from student protocols (indicated with by P) or generated by the authors to facilitate coding. A summary of topic codes is provided in Appendix 2.

TOPIC DESCRIPTIONS

1.0 SOCIAL CONTEXT

Requests included under this topic indicate an awareness of social factors which may influence the quality of the research and the validity of the data or conclusion. Questions included under Social Context may refer to the researchers or experimenters who conducted the study described in the news brief, promoters/detractors of the results reported in the news brief (e.g., Mind Matters), creators of the agent (i.e., who made the agent Ollinite), experts (e.g., other researchers/experimenters) and other persons who may be associated with the research (e.g., have an opinion on the research). These topics are found under section 1.1 People. Also included under Social Context are the topics concerning the publication outlet of the research and the author(s)/broadcasters of the publication. These topics are found under the section 1.2 Source of Information. Finally, included under Social Context are topics concerning other elements of the research context including topics 1.3 Funding Issues, 1.4 Identification of Research Institution, and 1.5 Source of the Research Question. Questions that refer to a specific and identifiable topic related to social context, but are different from topics 1.1 to 1.5 are categorized under 1.6 Social Context - Other.

Requests that refer to topics concerning Social Context but are too rudimentary or ambiguous to be categorized under topics 1.1 to 1.6 (i.e., refers to more than one topic listed under Social Context) are categorized as 1.0 Social Context.

Example

- Is this a marketing scam? (P)

1.1 PEOPLE

Included under this section are topics concerning the researchers or experimenters of the study described in the news brief (1.1.1), the promoters or detractors of the results described in the news brief (1.1.2), the creators of the agent (1.1.3), and other experts who may have an opinion on the research (1.1.4). Specific and identifiable questions that refer to people but are different from topics 1.1.1 to 1.1.4 are categorized as topic 1.1.5 (People - Other).

Requests that refer to People but are too rudimentary or ambiguous to be categorized under topics 1.1.1 to 1.1.5 (i.e., the respondent confuses the researchers with the promoters) are categorized as topic 1.1 (People).

1.1.1 Researchers/Experimenters

This topic concerns individuals who conducted the research described in the news brief. Included under this topic are questions about the identification of the researchers/experimenters (1.1.1.1), the number of researchers/experiments involved in the study (1.1.1.2), their testimonials regarding the research (1.1.1.3), training/qualifications/credentials of the researchers/experimenters (1.1.1.4) and motivations/biases of the researchers/experimenters (1.1.1.5). Specific and identifiable questions that refer to the researchers or experimenters, but are different from topics 1.1.1.1 to 1.1.1.5 are categorized under Researcher/Experimenter - Other (1.1.1.6).

- *Requests that refer to the researchers or experimenters but are too rudimentary or ambiguous to be categorized under topics 1.1.1.1 to 1.1.1.6 (i.e., fit in more that one topic listed under Researcher/Experimenter) are categorized as topic 1.1.1 (Researchers/Experimenters).*

1.1.1.1 Identification

This topic includes requests pertaining to the identity of the people who conducted the research described in the news brief. These questions are general (i.e., "Who were the researchers or experimenters?"). Detailed questions about the researchers' or experimenters' qualifications, motivations etc. are not included under this topic (see topics 1.1.1.4 Training, Qualifications, Credentials and 1.1.1.5 Motivation, Expectations, Biases, Beliefs).

Examples

Who are the researchers?
Who are the people who conducted the research? (P)

1.1.1.2 Number

This topic includes requests pertaining to the number of researchers/experimenters involved in the research described in the news brief.

Example

How many researchers were there?

1.1.1.3 Testimonials

This topic includes requests pertaining to comments or opinions that the researchers/experimenters may have about the research described in the news brief.

Example

What do the researchers have to say about Permaldrin?

1.1.1.4 Training/Qualification/Credentials

This topic includes requests pertaining to the training, qualifications, credentials of the researchers/experimenters who conducted the research described in the news brief.

Examples

Are the researchers qualified to do this research?
Where did the researchers get their training?
How much experience do the researchers have?

1.1.1.5 Motivation/Expectations/Biases/Beliefs

This topic includes requests pertaining to the motivations, biases, or beliefs that the researchers or experimenters may have had when designing the study, conducting the research, and analyzing and interpreting data. The questions must clearly refer to the researchers' or experimenters' motivations, expectations, biases, or beliefs. For example, the question "Were the researchers paid to 'find' these particular results?" would be categorized under 1.1.1.5 (Motivation/Expectations/Biases/ Beliefs). However, the question "Who funded the researchers?" would be categorized under topic 1.3 (Funding Issues).

Examples

Why did the researchers conduct this study?
Did the researchers want the results to turn out in this particular way?
Do the researchers believe the crystal will help people dream about the future?
Why would the researchers want to study crystals?

1.1.1.6 Researcher/Experimenter - Other

This topic includes identifiable and specific questions about the researchers/experimenters involved in the research described in the news brief but are different from topics 1.1.1.1 to 1.1.1.5.

1.1.2 Promoters and Detractors

This topic includes requests that concern the individuals who promoted the research that is described in the news brief (promoters) and\or individuals who defame the research that is described in the news brief (detractors). One group of promoters is introduced in each news brief (e.g., Mind Matters, Nature Unlimited, Autos for the Future). Also included under this topic are questions that refer to other potential promoters of the research but who are not introduced in the news brief (e.g., "What does Greenpeace have to say about this research?" is coded as topic 1.1.2.3). Finally, questions that refer to potential detractors of the research (not introduced in the news brief) are also included under this topic. The specific topics that fall under 1.1.2 Promoters or Detractors may refer to the identification (1.1.2.1), number (1.1.2.2), testimonials (1.1.2.3), training/credentials (1.1.2.4), and motivation/expectations/biases/ beliefs (1.1.2.5). Specific and identifiable questions that refer to the promoters or detractors of the research but are different from topics 1.1.1.1 to 1.1.1.5 are categorized as 1.1.1.6 (Promoters and Detractors - Other)

Requests that refer to the promoters or detractors but are too rudimentary or ambiguous to be categorized under topics 1.1.2.1 to 1.1.2.6 (i.e., fit in more than one topic listed under the topic Promoters and Detractors) are categorized as topic 1.1.2 (Promoters and Detractors).

Example

Where did Mind Matters get their facts?

1.1.2.1 Identification

This topic includes requests pertaining to the identity of the promoters/detractors of the results of the research described in the news brief. These questions are general (i.e., Who are Mind Matters?). Detailed questions about the promoters' qualifications, motivations, etc. are not included under this topic (see topics 1.1.2.4 Training, Qualifications, Credentials and

1.1.2.5 Motivations, Expectations, Biases, Beliefs).

Example

Who are Mind Matters?

1.1.2.2 Number

This topic includes requests pertaining to the number of promoters/detractors of the results described in the news brief.

Example

How many members are there in Mind Matters?

1.1.2.3 Testimonials

This topic includes requests pertaining to any comments or opinions that the promoters or detractors may have about the treatment above and beyond their endorsement described in the news brief.

Examples

What else does Mind Matters have to say about Ollinite?
What does Greenpeace think about Permaldrin?

1.1.2.4 Training/Qualifications/Credentials

This topic includes requests pertaining to the training, qualifications, credentials of the promoters and detractors in regard to the treatment described in the news brief.

Examples

Are the members of Mind Matters qualified to make this statement?
Are Members of Lifestyles for Seniors familiar with the process of meditation? (P)
What kind of authority does Mind Matters have to make this statement? (P)
How long have Mind Matters been an established organization? (P)

1.1.2.5 Motivation/Expectations/Biases/Beliefs

This topic includes requests pertaining to the motivations, expectations, biases, and beliefs that the promoters or detractors may have for promoting or refuting the results.

Examples

What do members of Mind Matters have to gain by promoting these results?
Why did Mind Matters promote this research?
How objectively did members of Nature Unlimited evaluate the researchers' findings? (P)

1.1.2.6 Promoters and Detractors - Other

This topic includes specific and identifiable questions about the promoters and detractors of the results described in the news brief but are different from topics 1.1.2.1 to 1.1.2.5.

1.1.3 Creators of Agent

This topic concerns the people or group of people who discovered or developed the agent. Included under this topic are questions that refer to Identification (1.1.3.1), Number (1.1.3.2), Testimonials (1.1.3.3), Training/Qualifications/Credentials (1.1.3.4) and Motivation/ Expectations/Biases/Beliefs (1.1.3.5). Specific and identifiable questions that refer to the creators of the agent but are different from topics 1.1.3.1 to 1.1.3.5 are categorized as Creators of Agent - Other (1.1.3.6)

Requests that refer to the creators of the agent but are too rudimentary or ambiguous to be categorized under topics 1.1.3.1 to 1.1.3.6 (i.e., fit under more than one topic listed under Creators of Agent) are categorized as topic 1.1.1 (Creators of Agent).

1.1.3.1 Identification

This topic includes general questions pertaining to the identity of the creators of the treatment agent described in the news brief. Detailed questions about the creators' qualifications, motivations, etc. are not included under this topic (see topics 1.1.3.4. and 1.1.3.5).

Examples

Who created this pesticide?
Who discovered this crystal?
Who developed this meditation technique?

1.1.3.2 Number

- This topic includes requests pertaining to the number of creators of the treatment agent described in the news brief.

Example

How many people developed this technique?

1.1.3.3 Testimonials

This topic includes requests pertaining to comments or opinions that the creators of the treatment agent may have about the treatment agent described in the news brief.

Example

What do the creators of Quipmanol have to say about this conclusion?

1.1.3.4 Training/Qualification/Credentials

This topic includes requests pertaining to the training, qualifications, and credentials of the creators of the treatment agent.

Example

What kind of training did the creators of Permaldrin have?

1.1.3.5 Motivation/Expectations/Biases/Beliefs

This topic includes requests pertaining to the personal motivations or biases that the creators may have had for creating the treatment agent. These questions clearly refer to the creators' motivations and biases. Questions that refer to the pragmatic goal of creating the agent (e.g., "What is the Permaldrin used for?") are not included under this topic but are included under topic 2.2 (Agent Mechanisms and Effects/Side Effects).

Examples

What goal did the makers of Quipmanol have in mind when creating this product?
What would the creators of Permaldrin have to gain by allowing this situation to continue?

1.1.3.6 Creators of Agent - Other

This topic includes requests about the creators of the treatment agent used in the research described in the news brief but are different from topics 1.1.3.1 to 1.1.3.5.

1.1.4 Other Experts

This topic concerns other researchers/experimenters or professionals in the area of research (other than the promoters and detractors or the creators) who may have an opinion on the research agent. Included under this topic are questions that refer to Identification (1.1.4.1), Number (1.1.4.2), Testimonials (1.1.4.3), Training/ Qualifications/Credentials (1.1.4.4), and Motivation/Biases (1.1.4.5). Specific and identifiable questions that refer to other experts but are different from topics 1.1.4.1 to 1.1.4.5 are categorized as Other Experts - Other (1.1.4.6)

Requests that refer to other experts but are too rudimentary or ambiguous to be categorized under topics 1.1.4.1 to 1.1.4.6 (i.e., fits in more than one topic listed under Other Experts) are categorized as topic 1.1.4 (Other Experts).

1.1.4.1 Identification

This topic includes requests pertaining to the identity of other experts who may have an opinion about the research described in the news brief. These are general questions; they do not refer to the qualifications, motivations, etc. of the other experts. Detailed questions about the other experts' qualifications, motivations, etc. are not included under this topic (see topic 1.1.4.4. and 1.1.4.5).

Example

What other professionals are involved in this research?

1.1.4.2 Number

This topic includes requests pertaining to the number of other experts.

Example

How many other qualified people are involved in the research?

1.1.4.3 Testimonials

This topic includes requests pertaining to comments or opinions that other experts may have about the research described in the news brief. This topic does not include questions about whether there was consensus about the conclusions reached by the researchers described in the news brief. Questions concerning consensus (e.g., "Do other researchers agree with this conclusion?") are categorized under topic 6.4. (Consensus/Nonconsensus).

Examples

Do other researchers have something to say about this?
What do other researchers have to say about this?
What do teachers have to say about this?

1.1.4.4 Training/Qualification/Credentials

This topic includes requests about the training, qualifications, and credentials of the other experts in the research area.

Example

Are other professionals trained in this area?

1.1.4.5 Motivation/Expectations/Biases/Beliefs

This topic includes requests about the motivations, expectations, biases and/or beliefs of other experts that may affect their opinions or comments about the research described in the news brief. These questions clearly refer to the motivations and biases of other experts.

Example

Would other professionals be biased to support this?

1.1.4.6 Other Experts - Other

This topic includes requests about the other experts in the research area described in the news brief but do not fit in the topics, 1.1.4.1 to 1.1.4.5.

1.1.5 People - Other

This topic includes specific and identifiable questions about people who may be associated to the research described in the news brief (e.g., have an opinion about the research described in the news brief) but are different from the people listed under topics 1.1.1 to 1.1.4 (e.g., general public, consumers).

1.2 SOURCE OF INFORMATION

This section includes requests that pertain to the original or current publication outlet for the research described in the news brief (1.2.1) and the authors or broadcasters of the report (1.2.2). Questions categorized under 1.2.1 (Publication Outlet) may refer to the identity of the publication outlet, the credibility or prestige of the publication outlet, the biases of the publication outlet etc. Questions categorized under 1.2.2 (Authors/Broadcasters) may refer to the identity of the authors or broadcasters, their credentials or training, their biases, etc. Specific and identifiable questions that refer to the source of information but are different from topics 1.2.1 or 1.2.2 are categorized under 1.2.3 (Source of Information - Other).

AMBIGUOUS-Requests that refer to source of information but are too ambiguous to be categorized under topics 1.2.1, 1.2.2 or 1.2.3 (i.e. fit under more than one topic listed under Source of Information) are categorized as topic 1.2 (Source of Information).

1.2.1 Publication Outlet

This topic includes requests pertaining to the academic forum (ie. academic journal, conference presentation) or the nonacademic forum (i.e., news paper, TV broadcast) where the research in the news brief was originally or is currently presented.

Examples

Where was this research published?
Was this research ever published in a peer-reviewed journal?
What academic journal was this research presented in?

Did this come from the National Inquirer?
How prestigious is the journal?

1.2.2 Authors/Broadcasters

This topic concerns requests pertaining to authors of the original research report referred to in the news brief. Questions regarding the authors or broadcasters of the news brief that describes the research are also included under topic 1.2.2.

Example

Who wrote this report?
Are the reporters biased?
Are the reporters qualified to interpret this research?

1.2.3 Source of Information - Other

This topic concerns specific and identifiable questions pertaining the source of information but are different from topics 1.2.1. or 1.2.2.

1.3 FUNDING ISSUES

This topic concerns requests about the person(s) or institution that funded the research described in the news brief. Questions that focus on the researchers' or experimenters' motivations that may be influenced by the source of funding are not categorized under this topic but under topic 1.1.1.5. (Researchers' Motivations, Expectations, Biases, Beliefs). Questions that focus on the funders' motivations, credentials, etc, are included under topic 1.3 Funding Issues.

Examples

Who paid for this research?
Who was the granting agency?
Why would anyone pay for this kind of research to be conducted?
Who would be immoral enough to finance this type of research?
Did the makers of Quipmanol fund this research? (P)

1.4 IDENTIFICATION OF RESEARCH INSTITUTION

This topic concerns requests about the institution where the research described in the news brief was based. These questions must specifically refer to the research institution (e.g., "At what university did this research take place?"). Questions about the particular setting that the subjects

were exposed to during the research are not included under this topic but under topic 3.2.2 (Setting). Also, questions about the general research context (i.e., lab versus field) are not included under this topic but are included under topic 3.1.2 (Research Context). Finally, ambiguous questions about the location of research (e.g., "Where was the research conducted?") are not included under this topic but under topic 8.0 (Ambiguous but Relevant to the Research) because this question may refer to the research institution, the research context (lab versus natural environment) or to the setting, and not enough information is given to discriminate.

Examples

At what university are these researchers employed?
At what university was this research conducted?
Was this research conducted at the Alberta Environmental Centre or at a university?

1.5 SOURCE OF RESEARCH QUESTION-IDENTIFICATION

This topic concerns requests about the inspiration for the research described in the news brief.

Examples

What caused them to conduct this research in the first place?
Where did they get the idea to study the effect of crystals on dreaming?
Who started or thought of this? (P)

1.6 SOCIAL CONTEXT - OTHER

This topic includes requests that are related to the social context of the research described in the news brief but that are different from topics 1.1 (People), 1.2 (Source of Information), 1.3 (Funding Issues), 1.4 (Identification of Research Institution), or 1.5 (Source of the Research Question).

2.0 AGENT

The agent is the treatment described in the news brief (i.e., the agent is the 'thing' that produced the outcome). Exposing experimental subjects to an agent may involve exposing them to an object (e.g., crystal), a chemical (e.g., Permaldrin), or a process (e.g., meditation). Any changes that experimental subjects undergo are presumably caused by the agent. Included under this heading are questions that refer to the identification of the agent and its properties (2.1). Also included under this heading are questions that refer to the mechanism(s) by which the agent causes its effects and that refer to the nature of the effects/side effects (2.2). Finally questions that refer to alternative agents (2.3) are included under this heading. Specific and identifiable questions about the agent that are different from topics 2.1, 2.2 or 2.3 are categorized under topic 2.4 (Agent - Other).

Requests that refer to the agent described in the news brief (or similar agents) but that are too rudimentary or ambiguous to be categorized under topic 2.1 to 2.4 (i.e., fit under more than one topic listed under Agent) are categorized as topic 2.0 (Agent).

2.1 AGENT IDENTIFICATION/PROPERTIES

This topic includes requests that are designed to get information about the agent independent of its mechanism, effects or side effects. The questions may be general in that they regard the general identification of the agent (e.g., "What is Permaldrin?"). Questions under this topic may also be specific in that they may regard the properties of the agent. Knowing about some of these properties may help one understand the mechanism of the agent (e.g., "What is Permaldrin composed of?"). Questions that refer to properties of the agent that are not relevant to its mechanisms, but may influence its utility (e.g., cost of agent, access, availability, safety or danger, functional use) are included under topic 5.2 (Utility of Agent Application). Questions that refer to the mechanisms, effects or side effects of the agent are not included under this topic but are included under topic 2.2 (Agent Mechanisms, Effects/Side Effects). Typically these questions can be rephrased as "What is it?" questions.

Examples

What is Permaldrin?
Where do you find Ollinite?
What chemical elements make up Quipmanol?
What's involved in Mai Handu Meditation?
What are the steps involved in Mai Handu Meditation?

Where or what is this chemical found in? (P).

2.2 AGENT MECHANISMS, EFFECTS AND SIDE EFFECTS (THEORY)

This topic concerns requests about what the agent does, such as: (a)how the agent causes its effects or side effects and (b) what the nature of the effects or side effects are. Questions about how the agent causes its effects and side effects concern the theory of the mechanism(s) by which the agent produces the effect on the dependent variable. Such questions may refer to mediating variables that are necessary for the relationship between the agent and the outcome to hold. Questions about the effects and side effects concern the physical or behavioral outcome(s) that result from exposure to the agent. The "effects" refer to the dependent variable that the researchers were investigating. "Side effects" refer to aspects of the subject, other than the dependent variable, that are affected by exposure to the agent. Questions that address what the agent was designed to do (i.e., the goal that the creator had in mind when creating the agent, for example, the function of Permaldrin is to kill insects) are not included under this topic but are included under topic 5.2 (Utility of Agent Application). Questions that suggest that the negative side effects would detract from the utility of the agent are also coded as topic 5.2.

Agent Mechanisms/Theory: These questions may refer to the actual mechanisms that underlie the manner in which the agent causes its effects or side effects or they may refer to the underlying theory which links the agent to the effects/side effects. Often these requests address "how" the agent does something. The subject may request or propose a logical connection between the agent and the outcome without introducing a confound.

Examples

How does Ollinite cause people to dream accurately about the future?
Doesn't it seem counterintuitive that a poison reduces pollution? (This person is questioning the theory behind the claim.)
Assuming that the conclusion is true, what is the causal link between the chemical and air pollution reduction (P)
Do the 2 chemicals react with each other? (P)
How can dreams predict the future? (P)
How does Permaldrin enter the body of the robin?

Effects/Side Effects: The effects are the dependent variables that were investigated by researchers before and after exposure to the agent. The side effects are aspects of the subject, other than the dependent

variable, that may have been affected by exposure to the agent. If the subject is suggesting that the side effects would detract from the utility of the agent (i.e., costs outweigh the benefits), then the code is 5.2, Utility of Agent Application.

Examples

What does Permaldrin do to the body of a robin?
What are the side effects of using Quipmanol?
Does the crystal also affect their intelligence?
Are there negative side effects of using Quipmanol? (This mentions negative side effect which may be a 5.2 code but we are not sure why they mention the negative side effects, so it is coded as 2.2)
Does Quipmanol change other things in the car, like Antifreeze? (P)
If you dissected the robin would you find anything unusual because of the insecticide? (P).
Does it produce new pollution? (Note: There is no explicit reference to practicality or utility of agent application.)

2.3 ALTERNATIVE AGENTS

This topic includes requests that refer to other agents that may be similar to the agent described in the news brief. This topic may include general identification questions (e.g., "What kinds of crystals are there besides Ollinite that may have this effect?") or it may include specific questions about the properties, mechanisms or the effects and side effects of the alternative agents. The alternative agents were not involved in the research described in the news brief, thus they are not to be confused with confounding factors (see topic 3.1.4 Control of Other Factors/Confounding Factors). Questions that refer to alternative agents request information about the range of alternative forms of the agent that was described in the news brief.

Examples

Do other crystals have this effect on dreaming?
What other pesticides are available?
Are there other similar crystals?
How is Mai Handu meditation different from transcendental meditation? (P)
Was Mai Handu meditation the only type of meditation practiced? (P)

2.4 AGENT - OTHER

This topic includes specific and identifiable questions about the agent described in the news brief (or similar alternative agents) but are different from topics 2.1 to 2.3.

3.0 METHODS

Specific methodological questions may refer to the research design (3.1), agent delivery (3.2), the subjects who participated in the study (3.3), the measures used in the study (3.4), consistency of methods (3.5) and/or replicability of methods or procedures (3.6). Specific and identifiable methodological questions that are different from topics 3.1 to 3.6 are categorized under topic 3.7 (Methods - Other). Questions that concern similar research not described in the news brief are not categorized under this heading but are included under Topic 6.0 (Related Research) or subtopics of topic 6.0.

Requests that refer to methods (procedures, experiments) but are too ambiguous or rudimentary to be specifically categorized under topics 3.1 to 3.5 (i.e., fit under more than one topic listed under Methods) are categorized under topic 3.0 (Methods).

Examples

What type of methods did they use?
Did they use the scientific method?
What type of procedure did they use?
What type of experiment did they use?
What was the nature of the research? (P)
What experimental tools did the use to arrive at this conclusion? (P)
How many times was the procedure repeated? (P) [Could be 3.1 design or 3.6 replicability.]

3.1 DESIGN

This topic concerns requests about the design used to conduct the research described in the news brief. Questions regarding design entail general or specific questions about the type of design used (3.1.1) and the research context (3.1.2). Also included under this topic are questions regarding the duration of the study (3.1.3). Finally, questions may refer to the control of other factors (3.1.4). Specific and identifiable questions that refer to design but are different from topics 3.1.1 to 3.1.4 are categorized as Design - Other (3.1.5).

Requests that refer to design but are too ambiguous or rudimentary to be categorized under topics 3.1.1 to 3.1.5 (i.e., fit under more than one topic listed under Design) are categorized as topic 3.1 (Design).

3.1.1 Type of Design

This topic includes requests intended to get information about the nature of the design used in the research described in the news brief. The questions may be general or specific. Note that ambiguous questions about methods (e.g., "What type of methods/experiments/ procedures did they use?") are not included under topic 3.1.1 (Type of Design) but are included under the superordinate heading 3.0 (Methods).

Examples

What type of design did they use?
Was this a correlational (observational) or an experimental study?
Was this a cross-sectional or longitudinal study?
Was this a repeated measures study?
Is this a causation or correlational conclusion? (P)
Were (a) the same robins observed before exposure and after or (b) was one group exposed vs another group-not exposed? (P)

3.1.2 Research Context

This topic includes requests about the general context of the research described in the news brief (e.g., laboratory context versus field context). Questions about the immediate setting to which the subjects were exposed (e.g., temperature, noise level) are not included under this topic but are included under topic 3.2.2 (Setting). Also, questions that refer to the research institution where research is based are not included under this topic but are included under topic 1.4 (Identification of Research Location).

Example

Was this research conducted in a laboratory or out in the field?

3.1.3 Duration of the Research

This topic includes requests about the period of time over which the research observations were made. However, questions about the duration of the effect are not included under this topic but are included under topic 4.1.3 (Duration of Effect). Also, questions that refer to whether a longitudinal design was used are not included under this topic but are included under topic 3.1.1 (Type of Design).

Examples

How long did they do this study?
How long did they collect the measures for? (P)

3.1.4 Control of Other Factors/Confounding Factors

This topic concerns requests about other variables that should have been taken into account when designing the experiment such that alternative causes (i.e., not the agent) for the outcome can be ruled out. These questions must identify some connection to how the "other factor" could cause the outcome rather than the agent. The questions may be general or they may refer to specific types of confounding variables (see examples below). The variables that are included under this topic are those that can be controlled for experimentally (e.g., use of placebos to control for subject expectation or motivation, consistent setting for all subjects). Confounding variables that can be statistically controlled are also included under this topic. Variables that cannot be controlled for experimentally (but may influence the results) are not included under this topic (e.g., see topic 1.1.1.5 Researchers' Motivations and/or Biases). Questions about mediating variables that are necessary for the relationship between the agent and outcome are not included under this topic but are included under 2.2 (Agent Mechanisms/ Effects/Side Effects).

Examples: General Questions
Could other factors have caused this?
Was a control group used?
Did they statistically control other variables?
If the robins were exposed to any other external force, could the same reaction happen? (P)

Examples: Specific Questions
Could a placebo effect explain this effect?
What about a placebo effect?
Could it be that the people who wore the crystals produced more accurate dreams because of the instructions that they received? (procedure)
Could it be that they achieved these results because the measuring instruments were unreliable?
Could it be that the robins' age caused a decline in mating? (P)
Could it be that pollution levels were decreasing naturally anyway? (P)
Maybe they were mating less because there were more predators in the area? (P)
Perhaps their science scores were higher because they tested the

students at the end of the school year? (calendar time) (P)
Do you think the spread of environmentalism may be why the air is cleaner? (P)
Could some other source cause the decrease in mating behavior?

3.1.5 Design - Other

This topic includes requests about design but that do not fit under topics 3.1.1 to 3.1.4.

3.2 AGENT DELIVERY (PROCEDURE)

This topic includes requests about manner in which agent was delivered to the subjects (3.2.1, e.g., instructions, dosage), the setting or immediate surroundings of the subjects (3.2.2), the time of year in which the research was conducted (3.2.3) and the consistency of agent delivery (3.2.4). Specific and identifiable questions that refer to agent delivery but are different from topics 3.2.1 to 3.2.4 are categorized as Agent Delivery-Other (3.2.5).

Requests that refer to procedures but are too ambiguous or rudimentary to be categorized under topics 3.2.1 to 3.2.5 (i.e., fit under more than one topic listed under Agent Delivery) are categorized as topic 3.2 (Agent Delivery).

3.2.1 Nature of Agent Delivery

This topic includes requests about the manner in which the agent was delivered to the subjects.

Examples

How frequently were they exposed to this pesticide?
What kind of instructions did they give the subjects?
What dosage did they use?
What is the extent (area) of exposure?
What is the duration of exposure? [Note: This question is different from "How long did they research this?" (3.1.3 Duration of Research).]
How much Quipmanol is necessary to reduce pollution? (P)
What was the level of exposure? (P)

3.2.2 Setting

This topic includes requests that identify the immediate surroundings that subjects were exposed to while being investigated. However, questions regarding the manner in which setting confounds the interpretation of the results are not included under this topic but under topic 3.1.4 (Control of Other Factors/Confounding Factors).

Examples

In what city did they investigate the effects of Quipmanol on air pollution levels?
At what noise level were the subjects tested?
At what temperature were the subjects tested?
How many predators are there in the area? (P)

3.2.3 Calendar Time

This topic includes requests about when the research was conducted. These questions may be general (e.g., "When was this research conducted?") or they may be more specific (e.g., "Did they test students at the beginning or the year or at the end of the year?"). Questions that explicitly refer to how these time factors may affect the results (e.g., "Could it be that they studied the robins at a time when their reproductive rates are normally low anyway?") are not included under this topic but are included under topic 3.1.4 (Control of Other Factors/Confounding Factors).

Examples

When was the research conducted?
At what time of the year did they do this study?

3.2.4 Agent Delivery - Other

This topic includes specific and identifiable questions about procedure that are different from topics 3.2.1 to 3.2.4.

3.3 SUBJECTS

This topic includes requests about the subjects who participated in the research described in the news brief. Included under this topic are questions that refer to the identity of the subjects (3.3.1), the qualitative characteristics of the subjects (3.3.2), the number of subjects tested (3.3.3), the manner in which subjects were selected (3.3.4), the representativeness of the sample (3.3.5) and the expectations or

motivations of the subjects (3.3.6). Specific and identifiable questions that refer to subjects but are different from topics 3.3.1 to 3.3.6 are categorized under topic 3.3.7 (Subjects - Other).

Requests that refer to subjects but are too rudimentary or ambiguous to be categorized under topics 3.3.1 to 3.3.7 (i.e., fit under more than one topic listed under Subjects) are categorized as topic 3.3 (Subjects).

3.3.1 Identification

This topic includes general questions about the identification of the participants (subjects). This topic does not concern specific questions about the characteristics of the participants (see topic 3.3.2). This topic does not concern questions about researchers or participants other than subjects (see 1.0, Social Context).

Examples

Who were the subjects?
Who did they study? (P)

3.3.2 Qualitative Characteristics

This topic includes specific questions about the qualitative characteristics of the participants (including age). However, questions that explicitly refer to how subject characteristics may affect the results are not included under this topic but under topic 3.1.4 (Control of Other Factors/Confounding Factors), for example, "Maybe the students who used the textbook did well on the Provincial exam because they were smarter to begin with." Also, questions that refer to the type of subjects for which the results are limited to are not included under this topic but are included under topic 5.1 (Generalizability of Agent Effects), for example, "How old you have to be to see this effect?" Finally, questions that refer to base rates or the levels of the dependent variable investigated in the study (e.g., "What were the mating behaviors like before exposure to Permaldrin?" or "How well did the students perform on the Provincial exam before reading this textbook?") are not included under this topic but are included under topic 4.1.1 (Absolute Nature of the Data).

Examples

How old were the subjects?

Where did the subjects come from?
What breed of robin did they use?
What kind of cars did they use in the study?
Were the subjects happy people?
Are the seniors also on medication? (P)
What was the religious/social background of the people tested? (P)

3.3.3 Number of Subjects Tested

This topic includes requests about the number of subjects who participated in the research described in the news brief.

Examples

How many robins did they investigate?
How large was their sample size?

3.3.4 Sample Selection

This topic includes requests that refer to how the sample used in the research described in the news brief was selected from the general population. These questions must specifically refer to the issue of selection. However, questions that explicitly refer to how sample selection may confound the results (e.g., "Did the researchers use volunteers who believed in the powers of crystals are thus were likely to give false reports of their dreams?") are not included under this topic but are included under topic 3.1.4 (Control of Other Factors/Confounding Factors).

Examples

How did they get these people?
Did the people volunteer to participate in the study?
Where did they get the subjects from?
Did they randomly select their sample?
Did they include younger subjects in their sample?
Did the subjects volunteer to participate (i.e., self selection)?

3.3.5 Representativeness of Sample

This topic includes requests about whether the particular sample used in the research is representative of the population to which the results are to be generalized. These questions must explicitly refer to

the representativeness issue. However, questions that refer to the characteristics of the sample (e.g., "Did they test students from all economic levels?") but do not refer to the representativeness of the sample are not included under topic 3.3.4 but are included under topic 3.3.2 (Qualitative Characteristics).

Examples

Is this sample representative of the population to which the results will generalize?
Did they test students from all economic levels "to ensure that these results/interpretation can be generalized to all students?"

3.3.6 Expectations/Motivations/Awareness/Beliefs About the Design

This topic includes requests about any expectations or motivations, that the participants may have in regard to the research described in the news brief. However, questions that explicitly refer to how expectations or motivations may bias the results (e.g., "Could it be that people who were wearing the crystal expected the crystal to work and interpreted their dreams as being accurate?") are not included under this topic but under topic 3.1.4 (Control of Other Factors/Confounding Factors).

Examples

What did the seniors expect to get out of this meditation?
Did the subjects believe in the powers of the crystal?
Were the people aware of why they were wearing the crystal? (P)

3.3.7 Subjects - Other

This topic encompasses specific and identifiable questions about the subjects but are different from topics 3.3.1 to 3.3.6.

3.4 MEASURES

This topic includes requests about the manner in which variables (i.e., dependent and independent) were measured in the research described in the news brief. Included under this topic are questions that refer to the identification of measures (3.4.1), manipulation check (3.4.2), evaluation of measures (3.4.3), and use of additional measures (3.4.4). Specific and identifiable question that refer to measures but are different from topics 3.4.1 to 3.4.4 are categorized as Measures - Other (3.4.5).

Requests that refer to measures but are too rudimentary or ambiguous to be categorized under topics 3.4.1 to 3.4.5 (i.e., fit under more than one topic listed under Measures are categorized as topic 3.4 (Measures).

3.4.1 Identification of Measures

This topic includes requests about the identification of the measures used in the research described in the news brief. Questions about the identity of the measures used in the research may be basic identification questions or they may be more technical. Technical questions may pertain to the operational definition or refer to how or whether the levels of dependent variable were defined in observable terms. Questions not included within topic 3.4.1 refer to the quality of the measures (see topic 3.4.3 Evaluation of the Measures) or refer to the data collected from the measures (see topics under the heading 4.0 Data/Statistics).

Examples: Basic Identification

What were the measures?
Did they use reaction times or error rates as their dependent measure?
Did they use self-reports?
How were the dreams interpreted? (P)
What was the measure or criterion used to determine if meditation is beneficial? (P)
How did they measure pollution levels? (P)

Examples: Technical-Operational Definition of Dependent Variable

How is sense of well-being operationally defined?
What is your definition of well-being? (P)

3.4.2 Manipulation Check

This topic includes questions about how or whether the independent variable was measured in the research described in the news brief.

Example

Was the level of Quipmanol measured for each treatment condition?

3.4.3 Evaluation of the Measures

This topic includes the quality of the measures used in the research. These questions refer to the reliability, validity and precision of the measurement instruments. Questions that explicitly refer to how the lack of measurement reliability, validity and precision confounds the results (e.g., "Could it be that the researchers found this difference only because they couldn't measure 'sense of well-being' very accurately?") are not included under this topic but under topic 3.1.4 (Control of Other Factors/Confounding Factors).

Examples

Were they really measuring sense of well-being?
Were the measures valid?
Was the instrument that measured pollution reliable?
How accurate are the dreams?
Did the dreams come true?
How broad/specific were the predictions?
How does one know whether the dreams predict the future? (P)
Are the dreams general or specific? (P)

3.4.4 Additional Measures

This topic includes requests about how or whether the dependent variable described in the news brief was measured in other ways (e.g., "Did they also use the 'Well-Life Expectancy' scale along with the self reports?"). Questions under this topic refer to measures of the dependent variable only. However, questions about the measures of how the agent affects other aspects of the subjects used in the research (i.e. side effects) are included under topic 2.2 (Agent Mechanisms, Effects/Side Effects),for example, "Did they look at how their physical health is affected by meditation?" Also, questions that refer to the data collected from these other measures (e.g., "What were their scores on the 'Well-Life Expectancy' measure?") are not included under this topic but are categorized under topic 4.1.4 (Additional Data).

Examples

Did they get a psychologist's assessment of the seniors' sense of well-being?
How far in to the future were the predictions for? (P)

3.4.5 Measures - Other

This topic concerns specific and identifiable questions about the measures used in the research described in the news brief, but are different from topics 3.4.1 to 3.4.5.

Example

How vigilant were the observations? (P)

3.5 CONSISTENCY OF METHODS/PROCEDURES

This topic refers to the consistent use of methods or procedures for all subjects who were involved in the research described in the news brief. Questions that refer to consistent methodology may be general or specific in nature. Not included within topic 3.5 are questions that refer to how an inconsistent methodology may confound the results but are included under topic 3.1.4 (Control of Other Factors/Confounding Factors).

Example: General Methodological Consistency

Did they use consistent methods/procedures for all subjects?

Examples: Specific Methodological Consistency

Did all subjects get the same dose? (Agent Delivery)
Were all the subjects exposed to the same setting? (Setting)
Did they use the same Provincial exam for all students? (Measures)

3.6 REPLICABILITY OF METHODS/PROCEDURES

These questions refer to whether the methodology can be replicated by other researchers or experimenters. Questions within this topic generally address issues about whether the experiment can be replicated. However, questions that refer to data are not included under this topic but are included under topic 6.3 (Supporting Data/Data Replication).

Example

Can other researchers replicate the experiment?

3.7 METHODS - OTHER

This topic refers to specific and identifiable questions that are about methodology but are different from topics 3.1 to 3.6.

4.0 DATA/STATISTICS

This topic includes requests about the data collected in the research described in the news brief (4.1) and the statistics used to analyze the data (4.2). Specific and identifiable questions that refer to the data or statistics but are different from topics 4.1 and 4.2 are categorized as topic 4.1.5 (Data - Other) or topic 4.2.3 (Statistics - Other).

Requests that refer to data or statistics but are too rudimentary or ambiguous to be categorized under topics 4.1 or 4.2 (i.e., fit into more than one topic listed under Data/Statistics) are categorized as topic 4.0 (Data/Statistics).

Example

What proof do you have to back this up?

4.1 DATA

Specific questions about the data may refer to the absolute nature of the data gathered for the dependent variables (topic 4.1.1), the comparative nature of the data gathered for the dependent variable (topic 4.1.2), the duration of the effect (topic 4.1.3) and additional data that may have been gathered from additional measures, had they been used (topic 4.1.4). Specific questions about the data that do not fit into topics 4.1.1 to 4.1.4 are categorized under topic 4.1.5 (Data - Other).

Requests that refer to the data but are too ambiguous or rudimentary to fit under topics 4.1.1 to 4.1.5 (e.g., "What do the data look like?") are categorized under topic 4.1 (Data).

Examples

What do the data look like?
What are the data?

4.1.1 Absolute Nature of the Data for the Dependent Variables

This topic includes requests about the absolute nature of the data collected in regard to the dependent variable defined in the research. These questions may refer to quantitative data (e.g., "What were the test scores on the provincial exam?") or qualitative data (e.g., "What was the content of their dreams?"). Questions about base rates regarding the dependent variable are also included under this topic (e.g., "Did they dream about the future before they wore the

crystal?" or "How often did they dream about the future before they wore the crystal?"). However, questions that refer to data about the effects of the agent on variables other than the dependent variable (e.g., "How did they score in math after using the Science for Life textbook?") are not included under this topic but are included under topic 2.2 (Agent Mechanisms, Effects/Side Effects). Also, questions that refer to the comparative nature of data are not included under this topic but are included under topic 4.1.2. Questions about comparative data concern how the scores for the dependent variable changed before and after treatment or how the scores of the different treatment groups differed. Also, questions about data that may have been collected from additional measures, had they been used, are not included under this topic but are included under topic 4.1.4 (Additional Data).

Examples

What were the scores on the Provincial exam after reading the text?
What was the base reproductive rate of the robins?
What was the content of their dreams?
How frequently did they dream about the future?
Out of the individuals examined, how many benefited and how many did not? (P) [Note that the request refers to absolute data i.e., frequency data, not comparative data.]
What was their sense of well being before meditation (base rate)? (P)
What did they predict?
Can I see some examples of the dream reports?

4.1.2 Comparative Nature of the Data for the Dependent Variable

This topic includes requests that refer to between-subject, between-group, or within-subject comparisons in reference to the effect of the agent on the dependent variable. This topic includes requests about the size of effect (e.g., statistical significance of the results). These questions must explicitly refer to the comparative nature of the data. For example, the question "By how much does the current reproductive rate differ from the base rate?" would be categorized under topic 4.1.2. (Comparative Nature of Data) whereas the question "What was the base reproductive rate before exposure to Permaldrin?" would be categorized under topic 4.1.1 (Absolute Nature of the Data). Questions regarding statistical significance are included under this topic. Typically these requests ask for the differences in the effect before and after the agent was administered or comparisons of the effects of different agents.

Examples

Were the base reproductive rates of the robins significantly higher before they were exposed to Permaldrin?
Were these results statistically significant?
How much more higher is the seniors' sense of well being after meditation as compared to before the meditation?
How large of a reduction in air pollution? (P)

4.1.3 Duration of Effect

This topic includes requests about the duration of the effect of the treatment on the dependent variable. It does not include questions about the duration of the study (see topic 3.1.3 Duration of the Research) or duration of exposure to the agent (see topic 3.2.1 Nature of Agent Delivery).

Example

For how long were the pollution levels suppressed by Quipmanol?

4.1.4 Additional data

This topic includes requests about the data that would have been collected about the dependent variable had additional measures been used in the research described in the news brief. Also included here are requests for information about the dependent variable that may be collected without "formal measures" (e.g., "How long before you see an effect?"). However, questions that refer to additional measures (e.g., "Did they also use the 'Well-Life Expectancy Index' to measure sense of well-being?") are not included under this topic but are included under topic 3.4.4 (Additional Measures). Also, requests for information about side effects (i.e., not the dependent variable) are not included here but are included under topic 2.2 (Agent Mechanisms, Effects/Side Effects).

Examples

What were the seniors' scores on the Well-Life Expectancy Index?
How long before you see an effect? (P)

4.1.5 Data - Other

This topic includes specific and identifiable questions about the data

available in the experiment but are different from topics 4.1.1 to 4.1.4.

4.2 STATISTICS

Specific questions about the statistics used to analyze the data may refer to the nature of the statistics used in the research described in the news brief (topic 4.2.1) or to the appropriateness of the statistics (topic 4.2.2). Specific and identifiable questions that refer to statistics but are different from topics 4.2.1 or 4.2.2 are categorized under topic 4.2.3 (Statistics-Other).

Requests that refer to the statistics but are too ambiguous or rudimentary to fit under topics 4.2.1 to 4.2.3 (i.e., fit under more than one topic listed under Statistics) are categorized under topic 4.2 (Statistics).

Example

What about the statistics?

4.2.1 Type/Nature of Statistical Analysis

This topic includes requests about the type of statistical analysis that was performed in the research described in the news brief.

Examples

What kind of analysis did they perform?
How powerful was the statistical test?
Is the statistical test sensitive to interaction effects?

4.2.2 Appropriateness of Statistics

This topic includes requests about the appropriateness of the statistical analysis used on the data collected in the research described in the news brief.

Examples

Did they do a t-test when they should have used an ANOVA?
Did they assume this causal relationship from a correlational analysis?

4.2.3 Statistics - Other

This topic includes specific and identifiable questions about the statistical analysis that are different from topics 4.2.1 to 4.2.2.

5.0 RELEVANCE OF THE AGENT/RESEARCH ON THE AGENT

This topic includes requests about the relevance of agent above and beyond the research findings described in the news brief (i.e., beyond the effects of the agent on the particular subjects that participated in the research described in the news brief). Included under this heading are questions that refer to the generalizability of the agent effects to other subjects, species, or environments (5.1), the utility or practicality of using the agent (5.2), the recency of the research (5.3), the importance of the research to an audience of consumers or researchers (5.4), the contribution of the research to the domain of study (5.5), and audience familiarity with the research (5.6). Specific and identifiable questions that refer to the relevance of the research but are different from topics 5.1 to 5.6 are categorized under topic 5.7 (Relevance - Other).

Requests that refer to the relevance of the research but that are too ambiguous or rudimentary to be categorized under topics 5.1 to 5.7 (i.e., fit under more than one topic listed under Relevance of Research) are categorized under topic 5.0 (Relevance of the Agent/Research on the Agent).

Examples

Why hasn't this been put in all gasses? (P) [Note that this is an ambiguous request as it could be coded as either 5.4 or 5.6.]
What will your company do to prevent accidents from occurring from this poisonous chemical? [Note that this is an ambiguous request as it could be coded as either 5.2 or 5.4.]

5.1 GENERALIZABILITY/SPECIFICITY OF AGENT EFFECT

This topic includes requests about whether the effects observed in the reported research would occur outside the particular research described in the news brief (i.e., generalize to other species and/or other environments). Also included under this topic are questions about the specificity of the effect to the subjects and environment used in the reported research. Typically these questions try to establish the boundary conditions (i.e., necessary conditions) under which the relationship between agent and outcome holds.

Examples

Are other birds affected by Permaldrin in the same way?
Are only robins affected?
Why are only robins affected?

Do you see this effect in humans as well?
Does this effect occur at lower doses?
Will you see this effect in the classroom setting?
How old do you have to be in order to have Mai Handu meditation increase your sense of well-being? (P) [Note that the question "How old were the seniors?" would be coded as topic 3.3.2, Qualitative Characteristics.]
Was the reaction the same for both males and females? (P)
What kind of gasoline does it have to be burned with? (P)
Does a certain kind of car have to be used to see this effect?
Does the subject have to believe in the crystal for it to work?

5.2 PRACTICALITY/UTILITY/FUNCTION OF AGENT APPLICATION

This topic includes requests about the practicality of applying or using the agent in the real world (i.e., beyond the confines of the research environment). Included under this topic are questions about the costs or benefits of the agent, the accessibility or availability of the agent, the safety or danger of using the agent, and whether there is a need or demand for the agent. Questions may include requests about who will use the agent, what use the agent will be, or mention factors that would detract from the utility or application of the agent even if the effects were reliable. Questions about the importance of the finding to people are included within topic 5.4 (Impact of the Agent/Research Findings/ Conclusion).

Examples

Would it be practical to get all seniors to try this meditation?
Do the costs of Quipmanol outweigh the benefits?
Do we really need to use Permaldrin-is it worth it?
How expensive is Quipmanol?
Do we need Quipmanol to reduce pollution?
How readily available is the chemical in terms of abundancy? (P)
How much does it cost? (P)
Why would we want to poison the air in order to reduce pollution? (P)
[Note that this subject has accepted the theory behind the research but the practicality of the research is questioned here. If the question were "Doesn't poison pollute the air?", it would be categorized as topic 2.2 (Agent Mechanisms, Effects/Side Effects) because the theory is brought into question.]
Who would handle Quipmanol, the driver or the gas company? (P)

5.3 RECENCY OF RESEARCH

This topic includes requests about how current the research described in the news brief is. However, questions that refer to time-related issues (e.g., "When was this research conducted?") but do not explicitly refer to how current the research is are not included under this topic but under topic 3.2.3 (Calendar Time).

Examples

Is this research up to date?
Is their research approach up to date?

5.4 IMPACT OF THE AGENT/RESEARCH FINDINGS/CONCLUSION

This topic includes requests about the importance of the research findings to an audience of either researchers or general public. This topic includes questions about the audiences' attitude towards the research and how they have reacted to the research (i.e., changed their behavior as a consequence of the research). Subjects typically assume the research is true and try to establish what influence it will have based on people's reactions. However, questions that specifically address whether or not people will use the agent are coded topic 5.2 (Practicality/Utility/ Function of Agent Application).

Examples

Who cares about the research?
Do other researchers recognize this research finding as being important?
What kind of impact will this research have on our behaviors-that is will researchers try and find another way to deal with insects other than with Permaldrin?
Have insecticide manufacturers responded to this research by not making Permaldrin?
Why would anyone want to study the effects of crystals?
Are gas manufacturers going to add Quipmanol to their gas as a result of this research?
Does adopting this meditation mean sacrificing other beliefs? (P)
Is the decline of robins a problem? (P)
Why is this pesticide still being used? (P)
What will be done to improve the situation of the robins? (P)
How dangerous is the current level of air pollution? (P)
Are there any immediate ways that we can reduce the chemical? (P)

Would robins still be successful in keeping their population at a steady level even though they are mating less? (P)

5.5 CONTRIBUTION OF KNOWLEDGE THIS RESEARCH ADDS TO THE DOMAIN

This topic includes requests about how or whether the research findings add to what researchers already know about the domain, how or whether the findings will affect the theories within the domain, or how or whether the findings will affect how other researchers will study the domain in the future. Questions in this area address whether the findings will change beliefs or existing knowledge in the area.

Examples

How does this research add to what we know about seniors' sense of well-being?
Will these research findings modify any theories of seniors' sense of well-being?

5.6 AUDIENCE FAMILIARITY WITH THE AGENT/RESEARCH FINDINGS

This topic includes requests about how well-known the agent or research is to either researchers or to the general public.

Examples

Why haven't I heard of Quipmanol if its so important to controlling the air pollution?
Is the popularity of this growing? (P)
Do many people practice this type of meditation? [Note that this does not refer to the number of subjects who were exposed to the meditation in the research (topic 3.3.3, Number of Subjects) but the number of people outside the research context who practice the meditation. This form of participation is considered to reflect audience familiarity with the agent.]

5.7 RELEVANCE - OTHER

This topic includes specific and identifiable questions about the relevance of the research that are different from topics 5.1 to 5.6.

6.0 RELATED RESEARCH (BEYOND THE STUDY DESCRIBED IN THE NEWS BRIEF)

This topic includes requests about other research that is related to the research described in the news briefs. The other studies may be conducted by other researchers or by the same researchers described in the news brief but at a different time. Questions may specifically refer to the domain of study (6.1), the method of study (6.2), supporting data or data replication (6.3) or consensus (6.4). Specific and identifiable questions that refer to related research but are different from topics 6.1 to 6.4 are categorized under topic 6.5 (Related Research - Other).

Requests that refer to related research but are too ambiguous or rudimentary to be categorized under topics 6.1 to 6.5 (i.e., refer to more than one topic listed under Related Research, for example, "What about other research?" are categorized as topic 6.0 (Related Research).

6.1 SIMILAR DOMAIN OF STUDY

This topic includes requests about whether other studies have been done in the same domain and/or the number of other studies that have been done in the domain. This topic does not include questions about whether the same methods were used (see topic 6.2, Method of Study), whether supportive data from these studies have been collected (see topic 6.3, Supporting Data/Data Replication), nor consensus among other researchers about the conclusion (see topic 6.4, Consensus/Nonconsensus).

Examples

Have other researchers studied the effects of meditation on seniors' sense of well being?
How many studies have been done in this area?

6.2 METHOD OF STUDY

This topic includes requests about the methods used by other researchers who have studied the domain. Included under this topic are questions about the type of design, procedure, or measures that were used.

Examples

How did other researchers study the effects of meditation on seniors' sense of well-being?
Have other researchers measured the effects of meditation on seniors

sense of well-being in the same way?

6.3 SUPPORTING DATA/DATA REPLICATION

This topic includes requests as to whether similar results have been found in other similar studies. These questions may refer to data replication or to other data that supports the conclusion reported in the news brief. The studies that produced the supporting data may have been conducted by the researcher described in the news brief or by other researchers. Also included under this topic are questions about whether there are data from other studies that contradict the data collected in the research described in the news brief. However, this topic does not include questions about the reliability of measures (see topic 3.4.4, Evaluation of Measures). Also, questions that refer to consensus (agreement with interpretation) are not included under this topic but are included under topic 6.4 (Consensus/ Nonconsensus).

Examples

Have these results been attained in other studies?
Do other researchers get the same results?
Do other researchers get different results?
Have these results been replicated?
Do data from other studies support these finding?
Were the findings proven by other researchers in a controlled lab?
Have other researchers achieved similar results in a lab experiment (P)

6.4 CONSENSUS/NONCONSENSUS: AGREEMENT OR DISAGREEMENT WITH THE CONCLUSION

This topic includes requests about whether other experts (i.e., other researchers, promoters or detractors, creators of the agent) agree with the interpretation of the data collected in the research described in the news brief. General questions that refer to other experts' opinions but do not specifically refer to their opinion about the research conclusion (e.g., "What do other researchers have to say about this?") are not included under this topic but are included under topic 1.1.4.3 (Other Experts-Testimonials).

Examples

Do other researchers agree with this?
Do other researchers agree that meditation is effective in increasing

seniors' sense of well being?
Do other researchers agree that Permaldrin is the cause of decreased mating in robins?
Do the researchers agree with the conclusion of Members for Autos for the Future? (P)

6.5 RELATED RESEARCH - OTHER

This topic includes specific identifiable questions about related research that are different from topics 6.1 to 6.4.

7.0 OTHER

This topic includes specific identifiable questions that are relevant to the research described in the news brief but they are different from any of the topics outlined (1.0, 2.0, 3.0, 4.0, 5.0, and 6.0). These questions have not received a specific topic designation because they were asked infrequently. In future studies, specific and identifiable topics included under topic 7.0 (Other) may warrant a separate topic designation. (For now, include questions about disbelief here. If they are frequent in other studies, a separate topic can be created.)

Examples

Is the theory behind this research (crystals-dreaming) falsifiable?
Can this be proven scientifically?

8.0 AMBIGUOUS BUT RELEVANT TO THE RESEARCH DESCRIBED IN THE NEWS BRIEF

This topic includes requests that are relevant to the research described in the news brief but are ambiguous because they fit under two or more major topic headings (1.0, 2.0, 3.0, 4.0, 5.0 or 6.0). For clarification on "ambiguous", see Principle 3.

Examples

How did they determine this?
How did they come to this conclusion?
How much research has gone into this? (Within study versus beyond study)
Where was this research conducted? [Social Context (research institution) versus Methods (research context or setting)]
When was this research conducted? [Methods (calendar time) versus Relevance of Research (currency of research)]
What was the treatment? ("treatment" may refer to Agent or to Method)
How long had meditation been practiced for? [Method (subject characteristics or duration of exposure) versus Agent (properties)]
Why are they less likely to mate? (or) How is sense of well-being increased? [Note: These two questions do not refer to the agent so they cannot be categorized under 2.2. It is unclear what the subject was referring to when making the requests so they are coded as ambiguous.]

9.0 OFF-TASK (IRRELEVANT TO THE STUDY)

This topic includes requests that are not related to the research described in the news brief.

Examples

Are robins' mating behaviors really decreased after being exposed to Permaldrin?
Does Permaldrin really exists?

ASSIGNMENT OF KNOWLEDGE DOMAINS

The goal of this section is to outline the procedure for assigning knowledge domain codes to the justification of each request. This procedure usually requires an analysis of the response that follows prompts like, "How would an answer to this question help you to decide whether the underlined conclusion in the news brief is true?" Justifications should reflect the types of knowledge about scientific research that are the reasons or motivations behind the requests. Knowledge domain codes are intended to reflect the subjects' knowledge or understanding of why the information requested is important for evaluating scientific research.

The basic procedure for identifying knowledge domains underlying the request is similar to the procedure for assigning a topic. Initially, select a general heading and then try to identify the most specific category available. However, some level of inference may be required to identify the appropriate knowledge domain and a request can arise from a variety of knowledge domains. As with coding topics, it is important not to add anything to the response that may change it. Thus, the knowledge domain may be clearly expressed, may require some level of inference, or may remain unknown. When the reason for making the request can not be identified the justification should be coded as 6.0 (No Identifiable Knowledge Domain).

STEPS FOR ASSIGNING A KNOWLEDGE DOMAIN CODE

REMEMBER PRINCIPLE 1: *Assume the participant is doing the task.*

1) Read the justification that appears after prompts like: "How would an answer to this question help you to decide whether the underlined conclusion in the news brief is true?"

REMEMBER PRINCIPLE 2: *Knowledge domain codes should be made based on the information in both the justification and related request.*

NOTE: The use of a request may be essential to interpret the justification because it is conventional in discourse not to fully repeat an idea that has just been mentioned. Thus, interpreting the justification may require establishing the referential coherence between nouns in the request and pronouns in the justification.

2) Decide how the justification relates to the request. In some way, the justification must refer to the request or provide some link to the request in order to be coded as a justification. To find this link it may be

necessary to paraphrase the response. Be especially careful when paraphrasing not to add anything to the response that was not part of the initial statement.

3) To assign a knowledge domain code, decide which of the 'top level' categories encompasses the justification and related request. That is decide whether the justification is related to knowledge about "good" scientific practices and conventions (1.0), knowledge about the social context of science (2.0), knowledge about the function of science in society (3.0), is some other knowledge domain (4.0), is ambiguous but relevant (5.0) or is completely off-task and has no identifiable knowledge domain (6.0).

REMEMBER PRINCIPLE 3: *There are only three classes of justifications. Justifications may be: (a) rudimentary or ambiguous with respect to the categories listed; (b) representative of one of the categories listed; or (c) representative of an "other" category.*

REMEMBER PRINCIPLE 4: *Knowledge domain codes can be assigned to justifications on the basis of a strict or lenient criterion.*

4) Once general area is identified, examine the subcategories within that section to determine whether or not the justification can be classified further. Use the most specific level of classification into which the justification clearly fits.

a) Recall, from the description of Principle 3, that justifications that are too rudimentary or are too ambiguous to be given a specific category knowledge domain code should be given a knowledge domain code that reflects a more general level of classification. Note that if the justification is too rudimentary or ambiguous with respect to the top-level categories, the justification should be coded as 5.0 (Ambiguous but Relevant).

b) If justifications reflect information that is not captured by the specified categories, code the justification as an "other" category in line with the top-level category that best describes it. Note that if there is no top-level category that reflects the gist of the justification then the justification should be coded as 4.0 (Other).

c) If the justification clearly addresses more than one specific knowledge domain, it will be necessary to separate the justification into separate ideas according to the guidelines set out in the section

on "Identification of Requests and Justifications", and code each idea separately.

NOTE: It may be difficult to decide whether the justification reflects two separate knowledge domains or is ambiguous. If you can code the justification as knowledge domain 'a' AND knowledge domain 'b' then it reflects two ideas; if you can code the justification as knowledge domain 'a' OR knowledge domain 'b' then it is ambiguous.

d) Sometimes instead of providing a justification the participant requests new information in response to the second prompt. In these instances the new request should be given a topic code and the old request should be given a knowledge domain code 6.0 (No Identifiable Knowledge Domain).

e) The participant may also justify the request in response to the first prompt and a response to the second prompt would be redundant. In these instances both the topic and knowledge domain code can be assigned based on the response to the first prompt.

Example

Did they take other factors into consideration such that they know that Permaldrin caused the effect and not other factors?

NOTE: Examples provided with each knowledge domain description in the next section are not exhaustive and justifications may represent the same idea in different ways.

NOTE: Every idea which receives a topic code must receive a knowledge code that represents the justification for the request. If no justification is provided a knowledge domain code of 6.0 (No Identifiable Knowledge Domain) should be assigned. A summary of knowledge domain codes is provided in Appendix 3.

KNOWLEDGE DOMAIN DESCRIPTIONS

Whereas topic refers to the content of the question posed by participants, knowledge domain refers to the kinds of knowledge people use to evaluate reports of scientific research. Major categories include knowledge about "good" scientific practices and research (1.0), knowledge about the social context of science (2.0), knowledge about the functions of science in society (3.0). Responses that clearly are relevant but that do not fit into any of these categories should be coded as other (4.0). Responses that are rudimentary or are ambiguous because they fit into more than one knowledge domain are coded as ambiguous (5.0). Some responses do not represent any knowledge domain (6.0).

Knowledge domains 1.0 to 3.0 are organized hierarchically, from more general, superordinate categories to levels of more specific subordinate categories. Comments should be coded using the most precise subcategory possible. For example, if a person makes a remark that clearly indicates knowledge about the importance of sample size for inferences from data, the appropriate coding would be 1.6.1 (see codes below). If, however, the remark clearly indicates knowledge about sample size and effect size, then two separate codes would be appropriate (i.e., 1.6.1 and 1.6.2). If the remark relates to the immediately superordinate category but is different than any of the defined subordinate categories, it should be coded as other (i.e., 1.6.5). Finally, a remark may be clearly related to the superordinate category but it may be too ambiguous (i.e., it relates only partially to one or more subordinate categories) or too rudimentary (i.e., it represents knowledge related to the superordinate but is not sufficiently sophisticated or distinct to be assigned a subordinate code) to be categorized more precisely. In these cases the appropriate code would be 1.6 (the superordinate category).

1.0 KNOWLEDGE ABOUT "GOOD" SCIENTIFIC PRACTICES AND CONVENTIONS

Knowledge about "good" scientific practices and conventions includes what people know or believe about the proper conduct of research. Included is knowledge about the necessity of using an adequate research design (1.1), the role of theoretical explanation (1.2), the value of controlling for confounding variables in delineating the cause-effect relationship between the putative agent and the outcome (1.3), the value of identifying other similar forms of the agent that have identical effects (1.4), the processes of measurement (1.5) and statistical inference (1.6), the influence of consensual processes in the evaluation of data (1.7) and the significance of establishing boundary conditions under which the conclusion is valid (1.8). Other specific knowledge domains that are different from 1.1 to 1.8 are coded as 1.9 (Other). Responses that reflect a rudimentary or ambiguous knowledge of good scientific practices are coded as 1.0 (Knowledge About "Good" Scientific Practices and Conventions).

Examples

What was their method? It is important to use scientific methods.

Do they have adequate proof to back up this claim. You have to provide evidence before I believe the conclusion.

1.1 ADEQUACY OF RESEARCH DESIGN

Good scientists will use research designs that are adequate given the questions they are asking. For example correlational studies are appropriate for exploratory research, but a correlational design cannot be used when trying to establish a causal relationship. Included in this category are inquiries about the type of research design used and whether this type of design can support the type of conclusion being drawn.

Example

Was this an observational study or experimental study? If this was a correlational study the researchers should not make causal statements.

Was this a longitudinal study? I would have more faith in the conclusion if they collected data over an extended period of time.

1.2 THEORETICAL EXPLANATION

People sometimes seek an explanation about how the agent or treatment could have produced the outcome. We interpret these requests as reflecting a belief that "good science" goes beyond merely noting probabilistic relations between agent and outcome but also seeks to establish a plausible description of the variables or mechanisms that underlie that relation. Included in this category are inquiries about how the agent or treatment might cause a certain outcome, about other variables that might intervene between the agent and outcome, and about other variables that might be necessary for the agent to produce the outcome. The common characteristic is that the person accepts the proposal that the agent causes the outcome and is seeking an elaboration on the relation between agent and outcome. This category is to be distinguished from 1.3, where people suggest that other factors may have caused the outcome rather than the putative agent.

Examples

Why does this insecticide affect the mating? By understanding why something is the way it is, I would be more likely to believe what is told to me. I need to understand the reasoning behind the concept. (P)

What does Mai Handu meditation involve? The answer would help me to understand how the meditation might effect [sic] well being. (P)

Why does it (meditation) increase their well being? If they can show that meditation (satisfies) some mental or emotional need, then I can see it as being true. (P)

Why does this chemical cause a decline in the robins' mating behavior? If they can show that the chemical physically alters the brain or its structures, then that would make the conclusion more believable. (P)

How does the chemical reduce the mating behavior of the robin? This would help me to understand exactly what was happening to the bird due to the chemical. (P)

How are the 'Science of Life' books different from the other books used for the same course? Maybe the layout of the book helps students to better understand and remember the material, which would have an effect (+) on the provincial exam. (P)

1.3 CONTROLLING FOR CONFOUNDING VARIABLES/ELIMINATION OF OTHER CAUSES

Inquiries often are made about the possibility that something other than the putative treatment or agent might be responsible for the outcome. These inquiries reflect knowledge that inferences about the relations between an agent and an outcome can be wrong, and that other factors may be the cause of the outcome. Alternative causes may include characteristics of the subjects in the research, variables other than the putative agent associated with the treatment, and other extraneous factors. Inquiries about mediating variables that intervene between the agents referred to in the news brief and the outcome are not included under 1.3 but are instead coded as 1.2 Comments that seem to represent a mix of these subordinate categories or are too general to be classified in the subordinate categories should be classified as 1.3.

Examples

Was a control group used? To rule out other causes. (P)

Could there have been any other reasons for the miscarriages of the rats? Other reasons may disallow the data. (P)

What other factors could be involved in their conclusion? Maybe the birds have been exposed to other things which may have caused this conclusion. (P) [Note: This comment is coded as 1.3 because "other factors" could refer to pre-existing differences among subjects due to past exposure (1.3.1) or to confounding treatment variables (1.3.2).]

1.3.1 Subjects

Included here are comments indicating that pre-existing differences among subjects could have produced the outcome, such as motivations, incentives, expectations, biases, age, and other personal characteristics.

Examples

Who were the subjects in the study? If the people in the study were all interested in psychic phenomena I would less value the outcome and believe that they made dreams turn out the way they wanted to, but the stones had no involvement. (P)

Were all types of students with varying intellectual ability and capacity utilizing this research or were the types of students who used the 'Science for Life' text all on the same level? A student's

intellectual ability and capacity has an affect on exam marks with or without the 'Science for Life' book, therefore it could be the types of students that did well and not the book used to teach the material that made them do better. (P)

What kind of subjects were chosen to participate in the experiment? Some people burn calories more readily and everyone has a different metabolism. Perhaps this is the reason they burned more calories and it had nothing to do with the music. (P) [Note: This response is coded as 1.3.1 rather than 1.3 because a clear indication is given that the source of the observed effect lies in the subjects who participated in the study.]

What age group was tested? Age plays (an) important role in body metabolism and how many calories you burn. (P)
[Note: Again, this response is coded as 1.3.1 rather than 1.3 because a clear indication is given that the source of the observed effect lies in the subjects who participated in the study.]

Did the subjects know what the meditation was supposed to do. A placebo effect may be the reason for an increased sense of well-being.

1.3.2 Treatment

Included here are references to characteristics of the treatment conditions, other than the putative agent, that could have produced the outcome. This category is restricted to comments in which subjects explicitly refer to variables that could be manipulated in an experiment.

Example

How quiet were their surroundings? Maybe their sense of well being increased because they were studied in a quiet room.

1.3.3 Alternative Explanations - Other

This category is for comments about variables, other than subjects or treatment, that could have produced the outcome. (Comments that partially fit more than one subordinate category would be scored as 1.3, as would comments that are too vague to fit clearly in one of the more specific subordinate categories.)

Example
Were there predators in the area? Maybe the robins mated less because predators imposed on their mating.

1.4 IDENTIFICATION OF AGENTS OR TREATMENTS WITH IDENTICAL EFFECTS

Sometimes participants mention the value of finding an agent or treatment, other than the one in the report, that produces the same outcome as described in the report. To be coded 1.4, such comments should reflect knowledge that finding alternative agents can be important for identifying underlying mechanisms associated with that outcome. If the participant emphasizes the importance of finding alternative agents for practical reasons (e.g., for reducing costs or risks associated with producing that outcome), then the appropriate code is 3.1 (Utility for Application). Comments of this type also need to be distinguished from those involving alternative causes which may act as a confounding variable in the research (1.3, Controlling for Confounding Variables/Elimination of Other Causes). Finally, references to mediating variables that intervene between the agent and outcome are coded as 1.2 (Theoretical Explanation).

Examples

Can other elements be mixed with zinc to form gold? If other elements had the same effect on the zinc then it would allow me to believe that there is some common factor that transforms zinc into gold. (P)

Are there alternative insecticides that do the same job, but are less harmful? If a safer insecticide is used and robins' mating behavior isn't affected, then one knows Permaldrin is dangerous--it is the cause of decreases in mating behavior. (P) [Note: This person appears initially to be concerned with application (3.1), but in the justification it is clear that he or she is concerned primarily with identifying the cause.]

1.5 MEASUREMENT

Questions about measurement properties reflect knowledge that measures used in scientific research are not always appropriate. Specific subcategories include reliability and validity of measures. Often, however, questions and comments seem to represent a mix of these subordinate categories or are too general to be classified in the subordinate categories, and so 1.5 would be the appropriate

classification.

Example

How is a sense of well being measured? If it is by the researchers' own perception I am less likely to believe the conclusion than if it was measured scientifically. (P) [Note: The term "scientifically" is ambiguous.]

1.5.1 Reliability

Comments about the reliability (i.e., the self-consistency) of the measures are included here.

1.5.2 Validity

Participants often ask questions about whether the measures are valid in the sense that they accurately reflect what they are supposed to measure. We interpret these questions as reflecting knowledge about the importance of validity in measurement.

Comments about the importance of using other measures to collect converging or diverging evidence are included here as well. Converging evidence refers to data from other, independent measures indicating that the dependent variable is measuring the same thing as are other measures of the same construct. Diverging evidence refers to data showing that the dependent measure is not related to different constructs. Comments about the utility of measures other than those described in the report should be coded as 1.5.2 as well.

Note that this category is reserved for comments regarding "measures" within the reported study. Comments about converging "evidence" from other studies should be coded differently (see 1.7, Consensual Processes, for replication and for "fit" with evidence from other studies).

Examples

How do you measure sense of well-being? Validity of the measure may be an issue--you could be measuring something else. (P)

What did the subjects in the study have to say? If they were positive about the effects of the treatment, I would find the

conclusion more compelling.

How accurate were the dreams? If they were vague or abstract, I would not consider them to provide valid predictions of the future.

How is well being measured? Well being is a subjective phenomena and would be hard to measure.

1.5.3 Measurement - Other

Included here are references to other specific measurement problems (e.g., scaling problems, floor or ceiling effects).

Example

"How can you measure a sense of well being? This would help me to see if there is a reasonable scale for well being to see if different values could be compared." (P)

1.6 STATISTICAL INFERENCES ABOUT THE DATA

Included are comments reflecting knowledge, technical or intuitive, about characteristics of the data or data analyses that influence the validity of inferences made from the data. Comments that seem to represent a mix of these subordinate categories or are too general to be classified in the subordinate categories should be classified as 1.6. Questions about base rates are also included under 1.6.

Examples

How is this possible? If this answer was scientific and was supported with evidence, I would be more likely to believe it. (P)

Was there really a difference? If the difference they report is not real, then the conclusion will be misleading. [Note: The participant may be referring to more than one of the subordinate categories, but we cannot be sure which ones.]

Is this different than the base rate? If not, then I would not believe the conclusion. [Note: Clearly the participant knows about the importance of an appropriate comparison, but again we cannot determine which of the subordinate categories, if any, the participant has in mind.]

1.6.1 Sample Size

Included are remarks indicating knowledge that generalizations from the data are more likely to be valid when the sample size is relatively large (the law of large numbers).

Example

How many people were in the study? If there were many people in the study I would be more inclined to believe the underlined information.

1.6.2 Effect Size

Included are remarks indicating knowledge that generalizations from the data are more likely to be valid when the size of the effect (i.e., the difference between treatment and control groups, or between pre-treatment and post-treatment data) is relatively large.

Examples

How much would it reduce the level of pollution? If it reduces pollution a lot then it would seem to be true, if it doesn't it would be false. (P)

How many birds were tested? This would help me by showing that in many cases this occurred or in few cases this occurred. Many --> true, few --> false. (P)

How much of decline in mating behavior? If the decline is small, then I would find the statement false in the sense that it is oversensationalized. (P)

1.6.3 Variability

Included are comments indicating that variability in the data can have an important influence on conclusions about mean differences between groups.

Example

How variable is this characteristic in the general population of seniors they sampled from? If all the seniors in the area have a high sense of well being, then the meditation isn't making much of a difference.

1.6.4 Statistical Significance and Chance

Included are remarks indicating knowledge that differences (e.g., between groups) could be due to chance or measurement error, or that a test of statistical significance is needed to support the conclusion.

1.6.5 Statistical Inference - Other

Included here are references to other specific issues concerning statistical inference that do not fit into categories 1.6.1 to 1.6.4.

1.7 CONSENSUAL PROCESSES

Included in this category are comments reflecting an understanding that judgments about validity of findings and conclusions depends to a large extent on consensual agreement among researchers. In the scientific community consensual agreement depends in large part on whether a study has been replicated and on the degree to which the results and conclusions fit with extant data and theories. Comments that reflect an understanding of the impact of disagreement on the validity of conclusions in also included under this category. Comments that are too general to be classified in the subordinate categories should be classified as 1.7 (Consensual Processes). On the other hand, comments about replication by the original researchers should be coded as 1.7.1 (Replication by the Original Researchers), and comments about independent replications should be coded as 1.7.2 (Independent Replication). If the participant does not make clear reference to who has done the replication, the comment should be coded as 1.7.

Examples

How many studies have been conducted in this area? If many studies have been done, each finding the same thing then one can conclude that this insecticide is harmful. (P) [Note: Because "finding the same thing" could refer to replication (1.7.1 or 1.7.2) or fit with other evidence (1.7.3), this comment should be coded as 1.7.]

What kind of studies have been done? The answer would show me if there was any supporting evidence. (P) [Note: The reference to "any supporting evidence" could be to replication (1.7.1 or 1.7.2) or to other kinds of evidence (1.7.3). Because of the ambiguity, the comment should be coded as 1.7.]

1.7.1 Replication by the Original Researchers

Comments about the value of replication by the original researchers (i.e., the researchers involved in the study described in the report) are included here. Such comments are interpreted as reflecting knowledge that "good" scientists try to replicate their results.

Example

Have the researchers replicated their findings? If they did the same study again and found the same results, I would be more willing to accept their conclusion that the pesticide caused the decreased mating.

1.7.2 Independent Replication

Comments about the value of replication by independent researchers (i.e., not the original researchers) are included here. Such comments are interpreted as reflecting knowledge that an important activity of the scientific community is determining whether critical results can be replicated by independent researchers.

Example

Have other scientists around the world done the experiment and found the same results? If other scientists have found the same results then one knows that this gold producing process truly works and is no hoax. (P)

1.7.3 Fit with other Evidence or Theories

Included are comments reflecting knowledge that findings or conclusions are more compelling to the extent that they agree with extant data, concepts, and theories. The reference here is to results or conclusions from studies other than the one in the report. Comments regarding converging evidence obtained within the original study should be described in terms of validity (1.5.2).

1.7.4 Consensual Processes - Other

Included here are references to other specific issues concerning consensual processes that do not fit into categories 1.7.1 to 1.7.3.

1.8 BOUNDARY CONDITIONS

Boundary conditions refer to the conditions under which a finding or conclusion are likely to be valid. Questions about boundary conditions reflect a sensitivity to the fact that findings or conclusions often are subject to limitations that might have important implications for the generality of conclusions. Thus, requests about the generalizability and/or specificity of effects are included under this category. Questions about the representativeness of the sample (i.e., whether the sample is sufficiently representative of the larger population to permit acceptance of the conclusion) should be included here as well.

Examples

Does this insecticide have effects on other animals? If it had effects on more animals, I could believe it to a greater extent. (P)

Are the bodily procedures of a pregnant woman the same as in rats? Findings in rats does not mean it will happen in humans. (P)

Was this done in the wild or in a lab? It would convince me more if the robins were affected like this in their natural habitat. (P)

1.9 OTHER

Included are other comments relevant to knowledge about good scientific practices and conventions that do not fit into the categories above. [Comments that fit more than one category should be coded as 1.0 (Knowledge About "Good" Scientific Practices and Conventions).]

2.0 KNOWLEDGE ABOUT THE SOCIAL CONTEXT OF SCIENCE

Science exists in a social context, and many comments show an awareness of the potential influence of social factors on the quality of research and the validity of the data or conclusions. Characteristics of the researchers, the funding agencies, and the communication outlets (e.g., journals, conferences) often are viewed as being important indicators of good research.

2.1 RESEARCHERS OR RESEARCH GROUPS

Examples

Who are the researchers? To find out if the data collected are correct. (P)

Who are the researchers? To discover the validity of their data. (P)

Who did the research? This would help me to understand if there is any substance behind the claim. (P)

2.1.1 Quality

Included are comments about the qualifications, training, reputation, and knowledge of the researcher and/or the prestige and quality of the research environment in which the researcher works.

Examples

Have professional researchers conducted the research in this area? I would be more willing to accept it if this is true. (P)

Who did the research? If the research was done by a reputable organization I would be inclined to believe it. (P)

2.1.2 Biases

Included are comments about possible motivations or expectations on the part of the researcher that might bias the research. These biases may be intentional or unintentional, and they may originate within the researcher or from external sources. [Comments about biases associated with funding agencies should be coded as 2.2.2 (Biases).]

Example

Were the researchers members of Autos for the Futures? Motivation for finding. (P)

2.1.3 Researchers or Research Groups - Other

Included here are references to other specific issues concerning the researchers or research groups that do not fit into categories 2.1.1 or 2.1.2.

2.2 SOURCE OF FUNDING

2.2.1 Quality

Included are comments about the reputation and prestige of the agency funding the research.

Example

Who funded this? If it was a reputable agency, I would be more willing to believe that the study was peer-reviewed and thus the data more believable.

2.2.2 Biases

Included are comments about possible motivations or expectations on the part of the funding agency that might bias the research.

Example

Who funded this? If the manufacturers of Quipmanol funded this, I would not be willing to believe their claim that it reduces pollution.

2.2.3 Source of Funding - Other

Included here are references to other specific issues concerning the source of funding that do not fit into categories 2.2.1 or 2.2.2.

2.3 COMMUNICATION OUTLET

2.3.1 Quality

Included are comments about the reputation and prestige of the outlet in which the research was publicized, such as journals, books, conferences, newspapers, and radio interviews.

Example

Where was this research published? If it made it through a peer-reviewed journal, I would be more willing to believe the results.

2.3.2 Biases

Included are comments about possible motivations or expectations associated with the communication outlet that might bias the research or the information that is reported.

Example

Were these research findings taken from a pamphlet distributed by the makers of Quipmanol or from an unbiased source? A biased source may not present a true picture of the findings.

2.3.3 Communication Outlet - Other

Included here are references to other specific issues concerning the communication outlet that do not fit into categories 2.3.1 or 2.3.2.

2.4 PROMOTERS AND DETRACTORS

Promoters and detractors include individuals or special interest groups who interpret and publicize scientific research to manipulate opinions or behavior. References to regular publications (e.g., newspapers) should be coded as 2.4.

2.4.1 Quality

Included are comments about the reputation and prestige of the promoters or detractors.

Example

Who are Mind Matters? If they are quacks, I won't believe the conclusion.

2.4.2 Biases

Included are comments about possible motivations or expectations associated with the promoters or detractors that might bias the way in which the research is interpreted and/or used.

Example

Do Autos for the Future have a vested interest in Quipmanol? If they are out to make a buck, I won't believe the conclusion.

2.4.3 Promoters and Detractors - Other

Included here are references to other specific issues concerning the promoters and detractors that do not fit into categories 2.4.1 or 2.4.2.

2.5 EXPERT OPINION

People often refer to the need for expert opinion in evaluating scientific research, indicating knowledge that experts might have insights or criticisms that can be influential. Included are requests for comments of the original researchers or any other expert. Requests for the opinions of participants in the reported study should be treated as requests for additional measures, 1.5.2 (Validity of Measurement).

Example

What do the researchers say about the conclusion? I would be more likely to believe the underlined conclusion if the people who did the study agree with it.

2.6 OTHER

Included are other comments relevant to knowledge about the social context of science that do not fit into the categories above. (Comments that fit more than one category should be coded as 2.0.)

3.0 KNOWLEDGE ABOUT THE FUNCTIONS OF SCIENCE IN SOCIETY

People sometimes use their knowledge about relations between science and society to evaluate conclusions from scientific research, even though these relations should be irrelevant. Particularly salient are two potential benefits of research: (a) the utility of scientific results for application in society; and (b) the informational value of scientific results for enhancing education or future research.

3.1 UTILITY FOR APPLICATION

Included are comments about the feasibility or expense involved in implementing changes based on the scientific research, or the probability that such changes would be used and useful. For example, the comments may refer to costs or benefits of using the agent, or the dangerousness and/or safety of using the agent outside of the research environment.

Examples

How does this poisonous chemical affect the environment and humans? If the chemical reduces air pollution, it may cause serious side effects also for the environment. (P)

Why or how is this chemical poisonous to us? It would help me decide on the potential health risks for all living creatures versus the environmental benefits gained. (P)

Are there other harmful effects? If cost outweighs the benefit then what good is it? (P)

What does Quipmanol become after being combusted? If the products of combustions are harmless, it will reduce air pollution. (P)

3.2 INFORMATION VALUE

Included are comments about the extent to which the research contributes to what is already known.

3.3 FUNCTIONS OF SCIENCE IN SOCIETY - OTHER

Included here are references to issues concerning the seriousness of the problem that the treatment (i.e. research findings) may address or may cause.

Examples

Why is it important to dream about the future? If the *reasons are* trivial, I am not interested in the research.

At what dosage of Permaldrin do robins stop mating? If it's only damaging at very high concentrations, then it's not an important problem.

4.0 OTHER

Included are comments that appear to be from specific knowledge domains that are different from 1.0 to 3.0.

Example

What is Mai Handu? I would like to try it for myself.

5.0 AMBIGUOUS

Included here are comments that are related to more than one of the knowledge domains described above.

6.0 NO IDENTIFIABLE KNOWLEDGE DOMAIN FOR REQUEST

Included are: (a) cases in which no response was provided, (b) comments that are off-task, (c) simple requests for additional information, and (d) remarks that are so profoundly ambiguous that we cannot determine whether a knowledge domain they represent a knowledge domain. With respect to comments that are off-task (b), participants must explicitly express disbelief to receive a code of 6.0. If disbelief is not explicit, then the code is determined by the thrust of the justification.

Examples

What hard-core evidence is there that praises this? If evidence is convincing, then I would be more willing to accept it. (P) [Note: The "reason" given is tautological and provides no clue to why hard-core evidence would be convincing.]

Does this work for everyone? If it does I would be very interested and willing to try it, but still would be skeptical. (P) [Note: This justification is off task.]

Does the type of music listened to while exercising matter, or does it have to be that particular type? Can other types of music be played and get the same results? (P) [Note: The first question appears to be related to 1.3 (Controlling for Confounding Variables/Elimination of Other Causes) but the justification response reveals no information about knowledge domain.]

What were the other people listening to? The other subjects' music could

have influenced the study. (P) [Note: No "other subjects" were described in the study, so this comment is interpreted as off task.]

How fit were the people to begin with? Validity of results? (P) [Note: This comment is too ambiguous to determine whether a knowledge domain is involved.]

IDENTIFICATION OF REQUESTS AND JUSTIFICATIONS

Recall that, ideally, each request and the corresponding justification should represent a single idea, however participants sometimes express two or more ideas in a single response. When this occurs, it is necessary to use a systematic procedure for partitioning the requests and justifications into separate idea units. The procedure used to partition a single response into separate idea units was developed in the study of prose comprehension and memory (e.g., Voss et. al., 1982). The accepted procedure is to divide a written protocol into units of text that represent a single, complete idea. Responses typically take a subject-predicate form and vary in length and complexity.

IDENTIFICATION OF IDEA UNITS

The first step in coding the protocol is for the coder to read through the entire response and decide if one or more ideas are contained in the response. Assume that the participants are using each numbered space to reflect one idea. If two or more ideas seem to be present, they should be separated only if they can be given different codes. Otherwise consider the ideas as equivalent expressions of the same idea and assign a single code. Typically, if subsequent ideas are presented parenthetically, a single code should be given, but if the ideas are separated by an "and" they should be given two codes. Indicate the division of dissimilar ideas by placing slash marks in the written protocol where one idea ends and the next begins (see examples below). Failure to make these divisions when dissimilar ideas are presented may lead to unreliable coding in later stages.

Examples of partitioning requests:

What age group was tested? (The participant is expressing one idea: age of subjects.)

What are the harmful effects of Quipmanol? (The participant is expressing one idea: side effects.)

Have other scientists around the world done the experiment and found the same result? (The participant is addressing one idea: other researchers finding this result when they did the experiment.)

How does this poisonous chemical affect the environment and humans? (The participant is asking two things but both are equivalent examples of the same idea: what are side effects of the chemical?)

What is Gowla music and what does it sound like? (The participant is asking about the agent and a more specific property of the agent, so this should be treated as one idea because both would be given the same topic code.)

Who funded this - Greenpeace? Independent granting agency? (The participant is asking two separate questions, yet both questions represent the same idea with the second question being an equivalent example of another funding source.)

How controlled was the experiment // and how would you set up an experiment find out if this side effect would be present in women? (The participant is expressing two ideas: experimental control and testing for generalizability.)

What is the element Knardium // and why haven't we heard about it? (The participant is expressing two ideas: identification of Knardium and familiarity with Knardium.)

Examples of partitioning justifications:

If I understand the theory behind the concept I would be more likely to believe it. (The participant expresses one idea: theory of experiment.)

To determine the validity of the experiment. (The participant is expressing one idea: experimental validity.)

The kind of student depends a lot on how smart they are etc. Generally kids of higher social status learn better and faster and are more interested in succeeding. If they only tested higher income kids the test would be invalid. (The participant is expressing one idea by elaborating on the example.)

If they are well known and well respected, I would be more likely to believe them. (The participant is expressing two ideas: familiarity of researchers and credibility of researchers, but both are equivalent expressions addressing the quality of the researchers. Thus only one code is given.)

If a lot of people have been tested // and the findings are all positive, then I would believe it. (The participant is addressing two ideas: number of subjects tested and converging evidence. Although both of these ideas may relate to replicabilty of the results, they are not equivalent and an assumption would have to be made to connect the ideas as one; so this should be given two codes.)

If research was done by reputable people // using scientific methods I would have more faith in the results. (The participant is expressing two ideas: reputation of the researchers and method of investigation.)

From the experiment conducted one can conclude whether biases were involved // or if it was conducted in a scientific manner. (The participant

is expressing two ideas: experimental bias and method of investigation.)

NUMBERING THE RESPONSES

The final step in coding might be to assign an identification number. In our research, a single, five digit number was assigned to each request and corresponding justification. The number identified the participant who the generated the response, the news brief the participant was reading, and the sequential order of the response. The first three digits refer to the participant number. The next digit represents the story, for example: 1 = insecticide, 2 = dream crystals, 3 = meditation, 4 = poisonous chemical, 5 = chemical element, 6 = slow speed music, 7 = anti-nausea drug, or 8 = textbook (see Appendix 1). The last digit represents the ordinal position of the request and related justification (e.g., 1 = first response generated; 4 = fourth response generated).

For example, if the item being coded was the third response generated about the pesticide story for participant 123, the code which identifies this response would be 12313 (participant 123, first story, third response). In instances where two or more idea units are present in one response add an alphabetical extension to the coding, i.e., 12313a for the first idea, and 12313b for the second.

ELABORATED PROCEDURE FOR CODING

Based on the procedures and guidelines for coding requests and justifications outlined in the previous sections, coding proceeds as follows:

1) Read the response to the first prompt.
2) Identify ideas that are requests and assign topic codes.
3) If a justification is included in the request, assign a knowledge domain code.
4) Read the response to the second prompt.
5) Identify ideas that are justifications and assign knowledge domain codes.
6) If a request is included in the justification, assign a topic code.
7) Number the responses.

Once you have used this procedure to score all your protocols, try to resume normal functioning by requesting a shore leave on the planet Risa (see Star Trek: The Next Generation).

REFERENCES

American Association for the Advancement of Science (1989). Supplement to Science. The AAAS Observer.

Science Council of Canada (1984). Science for Every Student: Educating Canadian's for Tomorrow's World (Report 36). Hull, Quebec: Canadian Government Publishing Centre.

Voss, J. F., Tyler, S. W., & Bisanz, G. L. (1982). Prose comprehension and memory. In C. R. Puff (Ed.) Handbook of research methods in human memory and cognition (pp. 349-383). New York: Academic Press.

APPENDIX 1

SAMPLE STORIES AND QUESTIONNAIRE PROMPTS

INSECTICIDE (1)

People are concerned that declines in wildlife populations will result in extinction for some species. Researchers have reported that robins that have been exposed to the insecticide Permaldrin are less likely to mate than usual. Members of Nature Unlimited have hailed this finding and have concluded that using this insecticide is an important factor in causing a decline in robins' mating behavior.

In the news brief above, please pay special attention to the underlined conclusion as you respond to the following three items in Section 1 and the request in Section 2.

SECTION 1

How likely do you think it is that the underlined conclusion is true?

Very Unlikely	1	2	3	4	5	6	7	Very Likely

How much experience with or knowledge of the general topic of the underlined conclusion do you have?

Little Experience or Knowledge	1	2	3	4	5	6	7	Much Experience or Knowledge

How closely related is the underlined conclusion to topics covered in natural and physical sciences such as Physics, Chemistry, or Biology?

Very Unrelated	1	2	3	4	5	6	7	Very Related

How interested are you in the general topic of the underlined conclusion?

Very Uninterested	1	2	3	4	5	6	7	Very Interested

SECTION 2

Suppose that the underlined conclusion is very important to you and that you must determine whether it is true. Please generate a list of as many questions as you can that you would want to have answered before you decide whether the conclusion made by members of Nature Unlimited is true. Also, for each question you list, please indicate how you think the answer to that question would help you to evaluate the conclusion in the news brief.

1. What is the first question you would want answered?

   How would an answer to this question help you to decide whether the underlined conclusion in the news brief is true?

2. What is the next question you would want answered?

   How would an answer to this question help you to decide whether the underlined conclusion in the news brief is true?

DREAM CRYSTALS (2)

People have long been interested in what the future holds. Researchers have reported that people who wear Ollinite crystals during sleep are more likely to have dreams that predict the future. Members of Mind Matters have hailed this finding and have concluded that wearing this crystal is important for increasing the frequency of dreams about future events.

MEDITATION (3)

People in Western countries have long been fascinated by traditional Eastern religious practices. Researchers have reported that senior citizens who practice Mai Handu meditation show an increased sense of well being. Members of Lifestyles for Seniors have hailed this finding and have concluded that practicing this meditation is important for increasing the sense of well-being in seniors.

POISONOUS CHEMICAL (4)

People are concerned about the environmental effects of automobile emissions. Researchers have reported that vehicles that burn gasoline

containing the poisonous chemical Quipmanol will reduce existing levels of air pollution. Members of Autos for the Future have hailed this finding and have concluded that fueling vehicles with a gasoline containing this poisonous chemical is important for decreasing current levels of air pollution.

CHEMICAL ELEMENT (5)

People have long been interested in possession of rare and precious metals. Researchers have reported that treating zinc with the element Knardium will produce gold. Members of Innovations in Chemistry have hailed this finding and have concluded that treating zinc with this chemical element is important for producing gold.

SLOW SPEED MUSIC (6)

People have shown a great interest in physical fitness and body weight. Researchers have reported that people listening to slow speed Gowla music while exercising will burn more calories. Members of the Healthy Lifestyle Group have hailed this finding and have concluded that listening to this slow speed music while exercising is important for burning more calories.

ANTI-NAUSEA DRUG (7)

There has been increased public interest in the side effects of drugs. Researchers have reported that pregnant rats given the anti-nausea drug Alprozam are more likely to experience miscarriages. Members of the National Birth Institute have hailed this finding and have concluded that taking this anti-nausea drug during pregnancy is an important factor in causing miscarriages.

TEXTBOOK (8)

The academic performance of youth is of concern to educators, scientists, and parents. Researchers have reported that students in schools where the "Science for Life" textbook is used score higher on the provincial science tests. Members of Learning Now have hailed this finding and have concluded that using this textbook is important for improving high school students' scores on provincial science tests.

APPENDIX 2

SUMMARY OF TOPIC CODES

1.0 SOCIAL CONTEXT

1.1 PEOPLE

1.1.1 Researchers/Experimenters

1.1.1.1 Identification
1.1.1.2 Number
1.1.1.3 Testimonials
1.1.1.4 Training/Qualification/Credentials
1.1.1.5 Motivation/Expectations/Biases/Beliefs
1.1.1.6 Researchers/Experimenters - Other

1.1.2 Promoters and Detractors

1.1.2.1 Identification
1.1.2.2 Number
1.1.2.3 Testimonials
1.1.2.4 Training/Qualifications/Credentials
1.1.2.5 Motivation/Expectations/Biases
1.1.2.6 Promoters and Detractors - Other

1.1.3 Creators of Agent

1.1.3.1 Identification
1.1.3.2 Number
1.1.3.3 Testimonials
1.1.3.4 Training/Qualification/Credentials
1.1.3.5 Motivation/Biases
1.1.3.6 Creators of Agent - Other

1.1.4 Other Experts

1.1.4.1 Identification
1.1.4.2 Number
1.1.4.3 Testimonials
1.1.4.4 Training/Qualification/Credentials
1.1.4.5 Motivation/Biases
1.1.4.6 Other Experts - Other

1.1.5 People - Other

1.2 SOURCE OF INFORMATION

1.2.1 Publication Outlet
1.2.2 Author(s) or Broadcasters
1.2.3 Source of Information - Other

1.3 FUNDING ISSUES
1.4 LOCATION OF RESEARCH - IDENTIFICATION
1.5 SOURCE OF RESEARCH QUESTION - IDENTIFICATION
1.6 SOCIAL CONTEXT - OTHER

2.0 AGENT
- 2.1 AGENT IDENTIFICATION/PROPERTIES
- 2.2 AGENT MECHANISMS, EFFECTS/SIDE EFFECTS (THEORY)
  - Agent Mechanisms
  - Side Effects
- 2.3 ALTERNATIVE AGENTS
- 2.4 AGENT - OTHER

3.0 METHODS
- 3.1 DESIGN
  - 3.1.1 Type of Design
  - 3.1.2 Research Context
  - 3.1.3 Duration of the Research
  - 3.1.4 Control of Other Factors/Confounding Factors
    - General
    - Specific
  - 3.1.5 Design - OTHER
- 3.2 AGENT DELIVERY (PROCEDURE)
  - 3.2.1 Nature of Agent Delivery
  - 3.2.2 Setting
  - 3.2.3 Calendar Time
  - 3.2.4 Agent Delivery - Other
- 3.3 SUBJECTS
  - 3.3.1 Identification
  - 3.3.2 Qualitative Characteristics
  - 3.3.3. Number of Subjects Tested
  - 3.3.4 Sample Selection
  - 3.3.5. Representativeness of Sample
  - 3.3.6. Expectations/Motivations/Awareness/Beliefs
  - 3.3.7. Subjects - Other
- 3.4 MEASURES
  - 3.4.1 Identification of Measures
    - Basic
    - Technical-Operational Definition of Dependent Variable
  - 3.4.2 Manipulation Check
  - 3.4.3 Evaluation of the measures
  - 3.4.4 Additional measures
  - 3.4.5 Measures - Other
- 3.5 CONSISTENCY OF METHODS/PROCEDURES
- 3.6 REPLICABILITY OF METHODS/PROCEDURES
- 3.7 METHODS - OTHER

4.0 DATA/STATISTICS
- 4.1 DATA
  - 4.1.1 Absolute Nature of the Data for the Dependent Variables

4.1.2 Comparative Nature of the Data for the Dependent Variable
4.1.3 Duration of Effect
4.1.4 Additional data
4.1.5 Data - Other
4.2 STATISTICS
4.2.1 Type/Nature of Statistical Analysis
4.2.2 Appropriateness of Statistics
4.2.3 Statistics - Other

5.0 RELEVANCE OF THE AGENT/RESEARCH ON THE AGENT
5.1 GENERALIZABILITY/SPECIFICITY OF AGENT EFFECT
5.2 PRACTICALITY/UTILITY/FUNCTION OF AGENT APPLICATION
5.3 RECENCY OF RESEARCH
5.4 IMPACT OF THE AGENT/RESEARCH FINDINGS/CONCLUSION
5.5 CONTRIBUTION OF THIS RESEARCH TO THE DOMAIN
5.6 AUDIENCE FAMILIARITY WITH THE RESEARCH FINDINGS
5.7 RELEVANCE - OTHER

6.0 RELATED RESEARCH (BEYOND THE STUDY DESCRIBED)
6.1 SIMILAR DOMAIN OF STUDY
6.2 METHOD OF STUDY
6.3 SUPPORTING DATA/DATA REPLICATION
6.4 CONSENSUS/NONCONSENSUS
6.5 RELATED RESEARCH - OTHER

7.0 OTHER

8.0 AMBIGUOUS BUT RELEVANT TO THE RESEARCH DESCRIBED

9.0 OFFTASK (IRRELEVANT TO THE STUDY)

APPENDIX 3

SUMMARY OF KNOWLEDGE DOMAIN CODES

1.0 KNOWLEDGE ABOUT "GOOD" SCIENTIFIC PRACTICES AND CONVENTIONS
- 1.1 ADEQUACY OF RESEARCH DESIGN
- 1.2 THEORETICAL EXPLANATION
- 1.3 CONTROLLING FOR CONFOUNDING VARIABLES/ELIMINATION OF OTHER CAUSES
  - 1.3.1 Subjects
  - 1.3.2 Treatment
  - 1.3.3 Alternative Explanations - Other
- 1.4 IDENTIFICATION OF AGENTS OR TREATMENTS WITH IDENTICAL EFFECTS
- 1.5 MEASUREMENT
  - 1.5.1 Reliability
  - 1.5.2 Validity
  - 1.5.3 Measurement - Other
- 1.6 STATISTICAL INFERENCES
  - 1.6.1 Sample size
  - 1.6.2 Effect size
  - 1.6.3 Variability
  - 1.6.4 Statistical Significance and Chance
  - 1.6.5 Statistical Inferences - Other
- 1.7 CONSENSUAL PROCESSES
  - 1.7.1 Replication by the Original Researchers
  - 1.7.2 Independent Replication
  - 1.7.3 Fit with other Evidence or Theories
  - 1.7.4 Consensual Processes - Other
- 1.8 BOUNDARY CONDITIONS
- 1.9 OTHER

2.0 KNOWLEDGE ABOUT THE SOCIAL CONTEXT OF SCIENCE
- 2.1 RESEARCHERS OR RESEARCH GROUPS
  - 2.1.1 Quality
  - 2.1.2 Biases
  - 2.1.3 Researchers - Other
- 2.2 SOURCE OF FUNDING
  - 2.2.1 Quality
  - 2.2.2 Biases
  - 2.2.3 Source of Funding - Other
- 2.3 COMMUNICATION OUTLET
  - 2.3.1 Quality
  - 2.3.2 Biases

2.3.3 Communication Outlet - Other
2.4 PROMOTERS AND DETRACTORS
2.4.1 Quality
2.4.2 Biases
2.4.3 Promoters and Detractors - Other
2.5 EXPERT OPINION
2.6 OTHER

3.0 KNOWLEDGE ABOUT THE FUNCTIONS OF SCIENCE IN SOCIETY
3.1 UTILITY FOR APPLICATION
3.2 INFORMATION VALUE
3.3 OTHER

4.0 OTHER

5.0 AMBIGUOUS

6.0 NO IDENTIFIABLE KNOWLEDGE DOMAIN

INDEX

Appendix 1, 76-78
Appendix 2, 79-81
Appendix 3, 82-83
Coding
    elaborated procedure, 74
    general procedure, 4
    overview of coding task, 3-4
    principle 1, 4-5, 7, 50
    principle 2, 5, 7, 50
    principle 3, 5, 7, 51
    principle 4, 6, 51
    principles, 4-6
    strict and lenient criteria, 6
Idea units, see under Responses
Introduction, 2-6
Justifications, see also Responses
    definition, 3
    included in requests, 4, 52
    omission of, 4, 52
Knowledge domains
    assignment of, 50-52
    definition, 50
    descriptions, 53-72
    summary of codes, 82-83, see Appendix 3
News briefs, 76-78, see Appendix 1
Numbering responses, see under Responses
Participants' task, 3
Partitioning responses, see under Responses
Principles, see under Coding
Prompts, 76-77, see Appendix 1
References, 75
Requests, 6, see also Responses
Responses, see also requests, justifications
    distinguishing justifications from requests, 6, 52
    identification of idea units, 72
    numbering, 74
    partitioning
        coding division of units, 74
        examples, 72-74
        justifications, 51-52, 73-74
        rationale, 72
        requests, 72-73

single or multiple, 72
Strict and lenient criteria, see under Coding
Topics
assignment of, 6-8
definition, 6
descriptions, 9-49
summary of codes, 79-81, see Appendix 2